AUGUST, 1957

American Engineer

IN THIS ISSUE . . .

A Professional Engineer Goes To Washington

by LeRoy Anderson, United States House of Representatives

Congressional Record
PROCEEDINGS AND DEBATES OF THE 85th CONGRESS, FIRST SESSION
No. 36
WASHINGTON, SATURDAY, MARCH 2, 1957
House of Representatives

Congressman Anderson tells about engineering and government.

A Logical Alliance—Engineering and Religion *by Dean C. J. Freund, U. of Detroit*

Are Engineers Throttling Science?
by S. S. Podnos, Department of Defense

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SURVEY REPORT:

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A comprehensive survey of the status of engineers employed by consulting engineering firms has recently been completed and is now available for distribution. The 40-page report contains basic statistical data on salaries, hours, fringe benefits, geographical distribution, size of firms, registration status, overtime pay practices, distribution of engineering employees by grades (including separate salary tabulations for each grade) and characteristics of the consulting firms.

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ENGINEER-EMPLOYER CRITERIA

The Criteria for Professional Employment of Engineers has now been published in booklet form and is being circulated widely to management, government officials, educators, associations and other groups. It is equally important that individual professional engineers be familiar with the content of the new publication.

The major purpose of the *Criteria* is perhaps best summarized by the continuing language from the introduction:

"As most engineers are employees, professional recognition is most significant in its application to the employed engineer-employer relationship. The professional status of the employed engineer, in all of its manifold aspects, needs to be fully recognized by the employed engineer and his employer if full and complete professional growth of the engineering profession is to be developed."

Publication Covers These Subjects:

Criteria for Employers	*Criteria for Individual Engineers*
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Indoctrination	**Interview**
Technical Development of the Individual	**Indoctrination**
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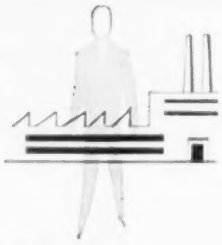

Appearing after more than a year of intensive research and study, this book is a major publication in the engineering-industry field. Brought together in compact form are a wealth of pertinent facts about the background and present situation bearing on the future professional development of engineers employed in all types of industry, and the related effects on all other professional engineers. 128 pages • 6 illustrative charts • 11 tables of economic data • fully documented by more than 250 references • bibliography and index.

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1957

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Letters to the Editor

Specs & Professionalism . . .

Dear Editor:

The most powerful and important instrument in engineering and the construction industry is the document giving the engineer jurisdiction over the job specifications.

Specification writing is necessarily performed by the designing engineer. More than any other factor "specs" govern the bidding; consequently, the cost. Many contractors have lost or gained jobs because of questionable specifications which influenced the cost estimate and subsequent price of the bid.

As the years pass more clauses are added to "standard specifications" until the contractor is robbed of his ingenuity and ability to produce. There are so many different interpretations possible that the purpose of the "specs" is obscured by arguments over interpretation. Vague inferences and indefinite phrases add to the confusion—ultimately the cost of the job.

Our entire specification structure is in need of overhauling. A new concept of specification writing which will accomplish the most economical and efficient results is needed. The practice of trying to substitute specifications for brains is costing the taxpayer millions of dollars every year in unnecessary expenses for public works construction. Specifications should be written in clear and positive language—items of work should be properly classified—attempts to define how the work is to be accomplished should be eliminated. Free enterprise and competition will determine the best methods and types of equipment—this would create standardization and eliminate the maze of variances now cluttering specifications—lower costs would result.

Many engineers feel that they must furnish a set of specifications which will compensate for the lack of adequately qualified personnel placed on jobs at field level. The practice of placing subprofessional personnel in the field armed with specifications they do not understand and requiring professional judgment is the most damaging injustice existing in the industry today. Such a condition has come about under the name of economy—now exploited in the name of politics.

CARL M. FISHER, P.E.,
Alice, Texas

About the Billboards . . .

Dear Editor:

In your June edition of the AMERICAN ENGINEER, the staff report on Federal Highway Administrator Bertram D. Tallamy contains the following sentence: "Coming down from New York State, where he was chairman of the Thruway Authority and thus the prime executive in that State's magnificent cross-state Thruway, Administrator Tallamy has plunged into Washington's high-level bureaucratic seas and set sail through waters beset by such shoals as committee hearings, Congressional maneuverings, and other assorted problems ranging from state highway department finances to the regulation of billboard advertising along the interstate highway network."

The purpose of this letter is to make the point that Administrator Tallamy has "set sail" through waters beset by the "regulation of billboard advertising along the interstate highway network" and sailed right on by the whole problem. It is true that Mr. Tallamy testified in behalf of the Administration's Bill concerning the regulation of such advertising. It is true that he testified that the "nesting" of billboards was a dangerous thing to have along a modern high-speed highway. But it is also true that Mr. Tallamy's voice in these matters was a bare whisper in the battle of words exchanged in Washington on the billboard problem.

If Mr. Tallamy was convinced as to the unsafe nature of billboards along the interstate thruways, why did he not come out and say so—forcefully and emphatically—and bring his engineering knowledge and skill out before the public in a broad appeal for legislation that would really forbid billboards. The answer to this question is quite simple. Mr. Tallamy did not make a vigorous plea for anti-billboard legislation because the Administration's Bill is full of holes through which the billboard people can slip their scenery defacing signs onto the highways. Mr. Tallamy, as an appointee of the present Administration, had to go along with the legislation proposed by this Administration.

In other words, politics has once again had the final word, even though the Highway Administrator's professional experience pointed clearly to the fact that billboards along thruways are not in the public interest.

As this letter is written, Congress has not voted on the amendment to the Highway Act that will spell out what the states can do as to billboard regulation. But all the indications are that the final piece of legislation will not keep the billboards from our new interstate system. The outdoor advertising industry and several trade union groups have apparently convinced enough legislators in Washington that any laws discriminating against billboards would have an adverse economic effect on many segments of industry and commerce.

As traffic on our highways becomes more and more congested, driving an automobile is beginning to be like flying a modern military aircraft. The driver must be constantly on the alert and must always be mindful of the stream of cars which are behind, alongside, and in front of him. Any advertising signs which are put up along a highway are put there with the idea that they will be looked at. In the split second that a driver's eyes are flicking across a billboard, a traffic situation could arise which would require the driver's instant attention. Any delay in his reaction time might be a fatal delay.

Americans have a precious heritage of scenic beauty. It is indeed unfortunate that we cannot have an interstate system of modern highways that would be uncluttered by billboards. Surely there is plenty of opportunity for advertising without defacing the countryside with signs. Our engineers know that billboards on high speed thruways are unsafe. The engineering profession has not lived up to its responsibility in protecting the public welfare in the struggle against billboards along the interstate system.

(Name withheld by request)

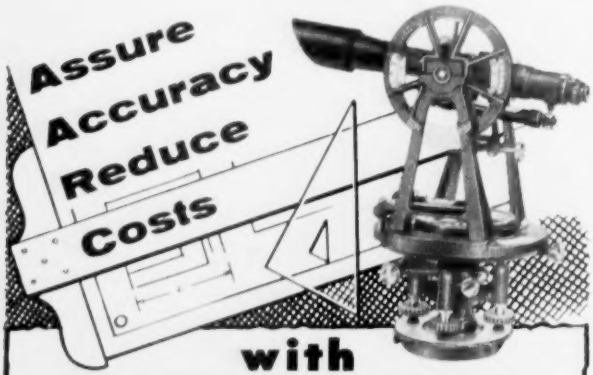
Honeywell Election . . .

Dear Editor:

I was pleased with your coverage of the recent NLRB conducted election at the Minneapolis-Honeywell Regulator plant. However, I cannot agree with your interpretation of the results as being a victory for professionalism. Although no statistics were given, I seriously doubt that a majority of those eligible were members of the MSPE nor have their actions indicated wholehearted support of NSPE policies.

On this basis, an analysis of the results is that it was a clear-cut victory for *negativism* with the voters rejecting *all* alternatives—professional groups included. This

(Continued on page 24)



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(Circle 2 on Inside Back Cover)

BPR Withdraws Contract Clause Restricting Employment of Highway Engineers

Withdrawal of a Bureau of Public Roads recommended contract clause restricting the employment of professional or technical personnel by consulting engineers under the Federal Highway Program has been commended by Garvin H. Dyer, NSPE president.

Under the proposed clause, consulting engineers holding design contracts with state highway departments would not be permitted to engage any personnel who were or had been in the employ of the Bureau or the highway department of any state, county or city, without the written consent of the public employer.

"We are gratified and appreciative of the action of the Bureau of Public Roads in undertaking a restudy and re-evaluation of the proposed contract clause which we felt would be detrimental to the interests of the Government and the engineering profession in the successful operation of the highway program," Mr. Dyer stated.

"The action now taken by the Bureau will, we are sure, strengthen the confidence of the engineering profession in the Bureau and aid in bringing about closer and more co-operative relations," he said.

The National Society's Board of Directors in February, 1957, requested withdrawal of the proposed contract clause and presented its views to BPR for review with an offer of the Society's services to the Bureau "in order to jointly arrive at a solution which will be mutually satisfactory." The NSPE statement said that the problem to which the proposed contract clause was addressed should be resolved by recognizing and acting on the salary differential between highway department engineers and those in industry and private practice. Also, it was stated that the clause would freeze highway department employees in their jobs or force them out of the highway program entirely, and would discourage young engineers from accepting positions with the highway department.

"We are particularly gratified," Mr. Dyer said, "that the recent announcement of the Bureau re-emphasizes the policy of adequate salaries for state highway department employees together with sound personnel policies. We are in full and complete agreement that such action is necessary, in the Bureau's words, of 'building and maintaining strong state highway departments.'"

The NSPE president also pointed out that this phase of the Bureau statement is in accord with a more recent NSPE Board resolution "that salaries paid by the state highway departments to engineers be increased so as to be commensurate with salaries paid by industry and other private employers for comparable services."

The recent NSPE resolution also called for the engagement of consulting engineers to supply the peak demand for engineering services. In line with this statement, the BPR an-

(Continued on page 24)

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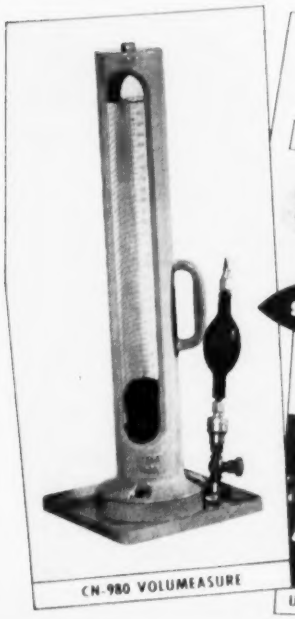

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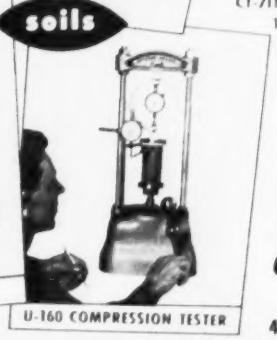

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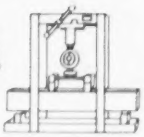
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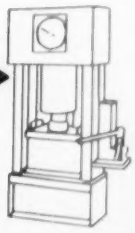
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(Circle 2 On Inside Back Cover)

PROFESSIONAL NEWS IN CAPSULE FORM

A Roundup of Late Events for Professional Engineers

Mandeville Appointed To Planning Commission

Gilbert H. Mandeville, Seattle consulting engineer, was appointed by Mayor Gordon S. Clinton to the Seattle City Planning Commission in June. The appointment is for a three year term.

Mandeville at present is the only appointed engineer on the Commission. He is chairman of the Community Projects Committee of the Seattle section of the American Society of Civil Engineers and a member of the Seattle Chamber of Commerce Urban Renewal Committee. Mandeville is also a member of NSPE.

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(Circle 3 on Inside Back Cover)

To Award Scholarships At WESCON, August 20-23

Scholarship prizes totaling $700 will be awarded three enterprising youths taking part in the Future Engineers Show to be held in connection with the Western Electronic Show and Convention, August 20-23, at San Francisco's Cow Palace.

Norman H. Moore, show vice-chairman, has announced that the West Coast Electronic Manufacturers Association, a co-sponsor of WESCON, has made available a special sum from its scholarship fund to create a prize award of $500 for the outstanding exhibit and $100 each for two honorable mentions.

In addition, Moore said, all youths taking part will be given a $25 bond in recognition of their interest and effort toward an engineering career.

Committees from sections of the Seventh Region, Institute of Radio Engineers (the other co-sponsor of WESCON), visited Science Fairs held in the western states this spring and selected outstanding exhibits related to electronics research and manufacture for an organized showing to more than 300,000 persons expected to register for WESCON.

"They say she went and saw the governor *in person* about condemning her land."

ASME Schedules Fall Meeting in Hartford

New developments in science and industry will be covered in the program of the fall meeting of The American Society of Mechanical Engineers. The meeting, to be held September 23-25 at the Statler Hotel, Hartford, Conn., is expected to attract Society members and other interested individuals from all parts of the country.

Features of the program include a President's Luncheon on September 23, when William F. Ryan, president of the ASME, will address the group, and a banquet to be held September 24. There will also be a panel discussion, on "What Can a Young Engineer do to Develop Professionally," and, as a special feature, an inspection trip to the Electric Boat Company, manufacturers of America's atomic-powered submarines. Participants will take part in a submarine trip under the surface on Long Island Sound.

J. Neils Thompson On Special BRAB Committee

Plans were outlined for identifying and documenting technical problems in FHA-insured housing at the initial meeting, July 1 and 2, of a newly-appointed Building Research Advisory Board Committee formed to advise the Federal Housing Administration on its technical studies program, it has been announced by William H. Scheick, BRAB executive director.

Among those serving on the Committee is J. Neils Thompson, an NSPE national director from Texas.

The Committee, which met at the National Academy of Sciences in Washington, D. C., will advise FHA on the organization of its known technical problems in order to establish priorities and the steps needed to effect solutions to the more critical ones.

Survey Shows GI Korean Bill Aided Technology

America's Age of Technology has received a sizable "shot in the arm" through the five-year-old Korean GI Bill education and training program, a Veterans Administration survey has disclosed.

One-third of all Korean GI trainees so far have trained for jobs in fields where technological advances are making greater and greater demands for skilled manpower, the survey showed.

In many of these fields, manpower shortages are critical, but would be even more severe were it not for GI-trained veterans, VA said.

To date, more than 1,800,000 Korea veterans have received training under the GI program that has eight more years to go. Of these, thirty-seven per cent trained for technical, industrial and scientific jobs—many of which were not in existence a generation ago.

More than 32,000 have specialized in various branches of science such as geology, physics and chemistry; another 135,000 studied engineering, and more than 400,000 enrolled in craft, trade and industrial fields such as electronics, metalwork and mechanics.

❁

Dr. Glen L. Corrigan Is Honored with $400 Award

For his promotion of the oil well and drilling industry, Dr. Glen L. Corrigan, head of the department of petroleum and geological engineering at Louisiana Tech, has been honored with a $400 award from the American Association of Oilwell and Drilling Contractors.

The Tech professor, an NSPE member, was selected by the Association as the teacher in the departments of petroleum and mechanical engineering at Tech doing the most toward the instruction of students and getting them interested in the fields related to the oil well and drilling industry.

Announcement of Dr. Corrigan's selection was made by Brad Mills, Dallas, Texas, executive vice president of AAODC. The award was presented to Dr. Corrigan by A. Earl White, chairman of the Ark-La-Tex Chapter of AAODC, at a recent meeting of the chapter in Shreveport, La.

Donald Bobo Awarded Fellowship to Harvard

Donald E. Bobo, of Lancaster, Ohio has been awarded the Kennecott Copper Fellowship of $2,000 for two years of study at the Harvard Business School. He is an NSPE member.

The Kennecott Copper Fellowship is awarded annually by the Kennecott Copper Corporation of New York for an engineer interested in the extractive and metal using industries. Candidates for the degree in master in business administration who have majored in mechanical, mining, metallurgical or industrial engineering are eligible for the award.

❁

Lovelace Elected Fellow in Society

Eldridge Lovelace, partner in the St. Louis firm of Harland Bartholomew & Associates, city planners, civil engineers and landscape architects, has been elected a Fellow of the American Society of Landscape Architects, it has been announced by Leon Zachs, of Washington, D. C., outgoing president of the Society at the ASLA annual meeting in San Francisco, July 10. Fellowships in the Society are voted annually to a small group of outstanding members of the landscape architecture profession. Mr. Lovelace is an NSPE member.

❁

RPI Confers Honorary Degree on Dr. Coover

In recognition of distinguished careers, Rensselaer Polytechnic Institute, Troy, N. Y., conferred honorary degrees upon five men at its commencement exercises on June 7.

Receiving the honorary degree, doctor of engineering, was Marvin S. Coover, a member of the teaching and administrative staff of Iowa State College since 1935.

Coover, a 1914 graduate of Rensselaer Polytechnic Institute, was awarded the degree in recognition of his contribution in the fields of teaching and technology.

An NSPE member, Coover served as head of the electrical engineering department at Iowa State from 1935 to 1954. At that time he was named associate dean of the Division of Engineering, and he currently serves as administrative assistant and professor of electrical engineering.

Engineering Educators Tell of Gov't. Project

American engineering educators who have spent a year or more in India during the past four years under the engineering education project sponsored by the U. S. Government there believe that "important values are accruing to the American professors as well as to the Indian institutions."

M. C. Withey, dean emeritus of the University of Wisconsin College of Engineering, who is the coordinator of the program centered on the Wisconsin campus under arrangements with the Federal Government, says in a report on the project that one of the professors reported after his year in India:

"Teaching, illustrating the American system by precept and public and private example and clarifying the attitudes of others toward the American way of life and American policy are our most important functions."

Other staff members expressed the same strong conviction, Withey reported.

❁

Mark Kulp Gets Award At University of Idaho

Mark Kulp, of Boise, a former University of Idaho professor who became State Reclamation Engineer in 1944 and who has made many significant contributions to Idaho agriculture was awarded a Doctor of Science Degree at the June graduation exercises of the University of Idaho.

While at the University of Idaho he made valuable contributions to the teaching profession and other technical literature dealing with problems of hydrology and irrigation engineering. Mr. Kulp served on the staff of the Department of Agricultural Engineering and the Idaho Agricultural Experiment Station starting in 1931. He earned a Master of Science Degree in Agricultural Engineering from the University of Idaho in 1933.

Mr. Kulp has been called the "protector and promoter of water resources for the citizens of Idaho." As State Reclamation Engineer, he has served on many inter-state committees, and has gained recognition as one of the West's outstanding authorities on water resources.

George T. Eaton Elected SPSE Head

George T. Eaton, of Kodak Research Laboratories, has been elected president of the National Society of Photographic Scientists and Engineers, it was announced today.

Steven Levinos, of Ansco, Binghamton, N. Y., was named executive vice president.

Other officers are John A. Maurer, New York, engineering vice president; Peter Krause, South Manhasset, N. Y., editorial vice president; Dr. Herbert Meyer, Pasadena, Calif., financial vice president; and Norton Goodwin, Washington, D. C., secretary-treasurer.

❁

Institute Announces Scholarship Programs

Young professional persons not now engaged in college or university study will have a chance to study abroad on the Fulbright and Buenos Aires Convention scholarship programs for 1958-59, it has been announced by Kenneth Holland, president of the Institute of International Education. Competition for these awards has opened and candidates may apply between now and next November 1.

Any U. S. citizen with a bachelor's degree is eligible for these foreign study awards. Applicants must be at the pre-doctoral level and preferably under the age of thirty-five. In addition, they must have a knowledge of the language of the country sufficient to carry on the proposed study, and good health.

The Fulbright awards for pre-doctoral study and research in Europe, Asia and Latin America cover transportation, tuition, books and maintenance for one academic year. The Buenos Aires Convention awards provide transportation from the U. S. government and maintenance and tuition from the government of the host country.

Persons interested in these awards can receive further information by writing to the Institute of International Education or its regional offices for the brochure, "United States Government Grants." The Information Division of IIE in New York City will answer inquiries from applicants about study facilities abroad.

❁

Petroleum Discussion Scheduled By ASME

Problems of one of the nation's key industries, petroleum, will be discussed by engineers representing all branches of operations during a three-day conference in Tulsa, Oklahoma, September 23-25, it has been announced. The occasion will be the Twelfth Conference of the Petroleum Division of the American Society of Mechanical Engineers to be held at the Hotel Mayo.

Included on the program are technical papers and panel discussions dealing with such topics as use of automatic technique in production and processing of petroleum, offshore drilling techniques, military fuel handling and ways of getting more mileage from the limited supply of available engineering talent.

In addition to the more than forty papers to be presented, there will be an unrehearsed panel discussion of the ASME Pressure Vessel Code, which outlines standard requirements for construction of much equipment used in the petroleum industry.

Another feature of the meeting will be the luncheons at which representatives of five branches of the industry, materials, refining, manufacturing, transportation and production, will exchange ideas on mutual problems. There will also be a welcoming luncheon at which the Mayor of Tulsa, George E. Norvell, will speak.

❁

Concrete Institute Plans Convention

The American Concrete Institute is planning its regional convention in Seattle, Wash., on November 4-6.

General technical sessions are scheduled for November 5 and 6. An interesting program is being planned and will consist of papers drawn from throughout the region affected. This region is intended to include California, Oregon, Washington, Nevada, Utah, Idaho, Montana, British Columbia, and Alaska.

❁

Sanitary Engineering Program Offered In Fall

A graduate program in sanitary engineering—stressing the fundamental sciences—will be offered this fall at the Illinois Institute of Technology, Chicago.

The program will produce an engineer-scientist who can perform well in any branch of sanitary engineering, according to Elmer I. Feisenheiser, director of Illinois Tech's civil engineering department.

Four foundation courses make up the program:

—Sanitary science, covering principles of inorganic chemistry, organic chemistry, biochemistry, nuclear physics, and biological decomposition.

—Sanitary engineering analyses, emphasizing derivation and analysis of data for use in rational design.

—Unit operations and processes in sanitary engineering, covering the rational design of the operations and processes used in sanitary engineering.

—Design of sanitary engineering treatment processes, dealing with the application of unit operations and processes to the design of the over-all treatment processes.

Admission is open to students with engineering bachelor's degrees. Both day and evening courses will be offered.

For further information, contact the Graduate Office, Illinois Institute of Technology, Technology Center, Chicago 16, Ill.

❁

Australian Company Is Interested in U. S. Items

A recent visitor to the W. C. Dillon & Company, Inc., of Van Nuys, Calif., was the president of T. K. Steane & Son Pty. Ltd. of Australia.

During the visit, Mr. Steane stated that he would like to get in contact with other American manufacturers seeking representation in Australia. His firm is especially interested in scientific and gauging instruments, he said.

Interested companies may write directly to Mr. Steane at P. O. Box 59, 113 Military Road, Spit Junction, Australia, enclosing literature and a complete sales story on the particular items.

AUGUST MEETINGS OF NOTE

Western Electronics Show and Convention—Annual Meeting, August 26-29, Cow Palace, San Francisco, California.

American Institute of Electrical Engineers—Pacific General Meeting, August 26-30, Yakima, Washington.

American Mathematical Society—Summer Meeting, August 26-30, Pennsylvania State University, University Park, Pennsylvania.

Appoint Dr. Ernst Weber Polytechnic President

Polytechnic Institute of Brooklyn has announced the appointment of Dr. Ernst Weber as acting president. He succeeds Dr. Harry S. Rogers who died on June 6.

A pioneer in high frequency electronic research, Dr. Weber was named vice president for research at Polytechnic in January of this year. Under his direction, Polytechnic's sponsored research programs in science and engineering represent annual expenditures of more than $2,250,000. He will retain his post as vice president.

❁

Public Health Service Awards Traineeships

The Public Health Service has awarded seventy-seven graduate traineeships in environmental sanitation for the 1957-58 school year, it was announced recently.

The awards were made to 32 sanitary engineers, 37 sanitarians, 3 chemists, 2 industrial hygienists, a geologist, a physicist, and a biologist. The awards went to persons from 28 states and Alaska.

The environmental health traineeships are available to engineers, sanitarians, chemists, and allied professional personnel who wish to enroll for graduate study in public health.

Applications may be obtained from any of the Department of Health, Education, and Welfare Regional Offices or from the Chief, Division of General Health Services, Bureau of State Services, Public Health Service, U. S. Department of Health, Education, and Welfare, Washington 25, D. C.

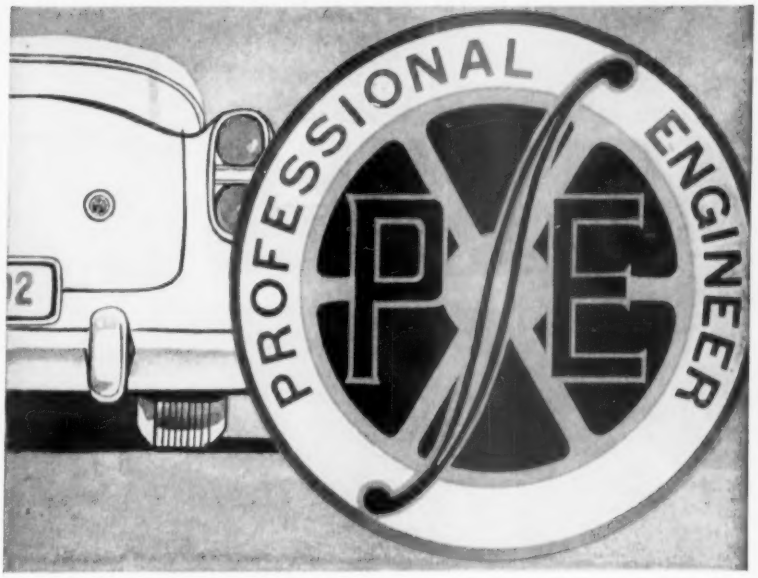
❁

Jennings Appointed To Position In ASHAE

The appointment of Professor Burgess H. Jennings, Evanston, Ill., as director of research for the American Society of Heating and Air-Conditioning Engineers has been announced by ASHAE President P. B. Gordon, New York, N. Y.

The Council of the Society approved this appointment during the ASHAE semi-annual meeting at Murray Bay, P. Q., Canada.

Professor Jennings will assume his new responsibilities about the middle of August, directing operations of the Society's research program both at the ASHAE Research Laboratory, Cleveland, Ohio and at cooperating institutions.



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(Circle 4 on Inside Back Cover)

American Engineer

The Magazine of the Registered Professional Engineer

VOLUME TWENTY-SEVEN NUMBER EIGHT

A Professional Engineer Goes to Washington

By

LeROY ANDERSON,

Member, U. S. House of Representatives from the State of Montana

ALMOST every day, members of Congress are called upon to decide some issue that deals with engineering. At yesterday's hearing, we listened to Chemical Engineer Jones describe the advantages of using a radioactive isotope as a tracer. Today, we hear Civil Engineer Smith give a description of the benefits to be derived from constructing a dam and hydroelectric plant in the West. Tomorrow, we will hear the testimony of Traffic Engineer Brown telling of the need for a throughway or a bypass around a congested city. And indications are that the issues will deal more and more with scientific subjects as time goes on. Thus, it becomes apparent that there is a growing need in the legislative bodies and civic organizations of our country for persons with a technical education, who understands scientific subject matter and are able to make enlightened decisions.

During World War II, the engineer was called upon to find immediate practical applications of the scientific theories. He answered this call by developing, within a few years, the technologically advanced equipment and effective weapons that shortened the war and brought victory to our side. Not only were the results of his efforts useful in winning a war, but they broadened the vistas of technological opportunity for the peaceful era to follow and the coming generations.

Today, we are asking the engineer to lend a hand in the direction of civic and public policy, which is so influenced by this technological advancement. We are asking him not to lose himself in the blueprints of his laboratory, but to emerge into the political world to help set up the blueprints for our country's future.

An engineer should not be content with the achievements of his profession. While he has played a vital role in providing our civilization with material comfort and ease, he must recognize that he is partly responsible for

Devastating floods are just one of the many problems facing Congress that call for engineering knowledge.

Huge sums of Federal money are spent on such projects as roads and bridges. The engineer-legislator is well-equipped to deal with these measures.

some of the unwanted effects of modern life. Automation not only allows us more leisure time, but might eliminate thousands of jobs. The advancements in the manufacturing of synthetics are raising serious problems relating to the economy of the cotton growing areas of the South. Atomic energy not only helped us win a war, and promises many peacetime benefits, but holds a constant threat of destroying mankind.

Because the local and national governments have to deal with all the consequences of technological achievements—beneficial or otherwise—the engineer should feel some moral responsibility for helping to find solutions for these problems. He should lend his knowledge not only in an advisory capacity, but as an administrator, a community leader, or as a legislator.

Before we complain that engineers have been unwilling to go into public life, let us look into some of the reasons behind this attitude. There is no reason to believe that engineers as a group are by nature shy or retiring or uninterested in life about them. But if we go back to the universities, we find that an engineer must forfeit most, if not all, of the assets of a broad liberal arts education to meet the training demands of his profession. A student of engineering, while completing the required science courses for his degree, stands a good chance of missing courses in American government and history, international affairs, or in political philosophy and the humanities; subjects that might stimulate a more active interest in the affairs of the country and the world.

In the university, the engineering student acquires the technical knowledge to use the complicated machines of our world as well as to create new devices and improve and develop existing ones, but he misses much of the educational background required to evaluate the impact of his work on society. His education has failed to impress him with the fact that he may have a unique contribution to make beyond professional engineering. So we have a situation where the products issuing from his study are profoundly affecting the daily life of every person, yet his interest in helping the administration of these inventions and discoveries is seldom active or strong enough to lure him into public life.

Another failure in the education of the engineer is the small emphasis put upon developing his ability to express himself adequately and to communicate his ideas simply and understandably. An engineer who can draw a complicated mechanical design with ease, may be at a complete loss in defending his views on community projects on which he is in position to advance constructive ideas. It is encouraging that more of the engineering schools are now insisting that their output be able to write and talk effectively.

The Eighty-fourth Congress was continuously occupied with legislation which called for a knowledge of engineering, and this Eighty-fifth Congress promises a like or even greater amount. The technical aspects of the particular bill or bills under consideration, are usually fully explained and discussed in the hearings held by the congressional committees.

Members of the House and Senate are assigned to committees. Each committee has jurisdiction over a particular legislative field. It may approve, revise, or kill any bill over which it has jurisdiction and may investigate the need for new legislation. Most of the highly technical testimony that committee members listen to during the hearings is presented by witnesses who are either for or against the proposed legislation. This renders the job of weighing the merits of the technical aspects even more difficult, and our independence of Federal agencies and pressure groups is lessened.

If a committee, when considering almost any program—be it national defense, public works, housing, transportation, or foreign aid—could have even one member with an engineering background, that member could provide the type of questioning and analytical review that is so essential to a fully considered committee action. Our form of government, with its system of checks and balances, would function most smoothly and efficiently with men whose backgrounds allow them to understand all of the current issues. More engineers in Congress would provide further checks on the executive agencies.

Fortunately, expert assistance is available to most committees. Competent specialists, who keep themselves constantly informed, help the members of Congress to understand the scientific material. However, some issues reach such technically complicated proportions, that only an engineer is able to follow the testimony. Congress could do the best job of legislating if some of its members, themselves, could understand and, on occasion, clarify and explain to the others, the scientific and engineering concepts, just as a lawyer or a banker could explain legal or financial concepts. Some of the following issues demonstrate what I mean.

In the field of atomic energy, the Eighty-fourth Congress had to deal with many of the technical phases of its development. Construction of a $40 million atomic-powered merchant ship was authorized and legislation was considered to provide Government indemnity to supplement private insurance against reactor hazards. The Joint Committee on Atomic Energy was expected to review and thoroughly understand a detailed report on the peacetime uses of atomic energy prepared by a special citizen's panel. The panel reviewed and made recommendations in many areas, including power, controlled thermonuclear power, medicine and public health, agriculture, radiation, preservation of food, atomic propulsion, and general industrial uses. The Congress considered a bill directing the Atomic Energy Commission to construct six nuclear powered facilities for the production of electric power, which would cost around $400 million.

Not only do legislative and executive leaders have the responsibility of seeing that the United States does not fall behind the Communist countries in our atomic development, but we must also take into account such serious considerations as whether to halt or to slow down the testing of H-bombs, and to weigh the scientific information as to the probable effects, short-term and long-term, of radioactive fall-out on humans and on the environment and food supply. We must consider the disposal of radioactive wastes, some of which will remain dangerously radioactive for centuries.

Certainly most Congressmen would feel more secure with a larger number of engineers in their ranks, when deciding such important issues. No matter how conscientiously one tries to understand the rapidly expanding mass of scientific information connected with this field, he is still, to a large extent, groping in the dark if he is not a scientist or an engineer.

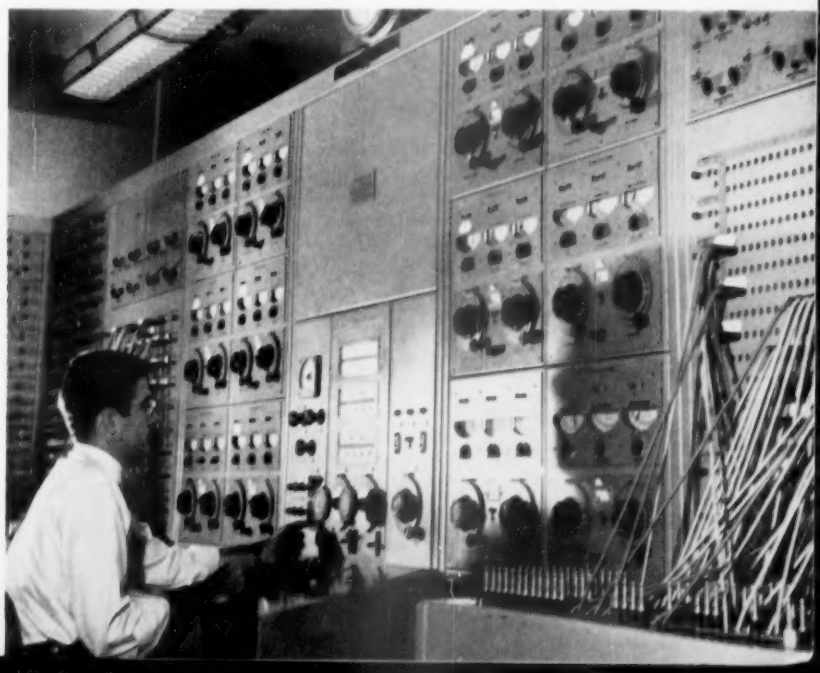
Fortunately, the other issues do not carry the dreadful implications connected with atomic energy. The reclamation projects, which supply our Western arid regions with irrigation water, and aid in preventing floods, developing power, supplying municipal water, conserving fish and wildlife, and developing recreation areas occupy a significant part of a Congressman's attention.

During the Eighty-fourth Congress, total authorizations of about $1.16 billion of reclamation legislation were put into law; largest of which was the $760 million Upper Colorado River Storage Project. Construction of these projects will bring under irrigation about 471,000 acres of new land and provide supplemental water to an additional 805,000 acres. Some 1.5 million kilowatts of hydroelectric power capacity, generating some 6.7 billion kilowatt hours of electric power per year will come on the line. Before the legislation was enacted, members of Congress sat through weeks and months of very technical testimony. In some cases, the lawmakers were asked to weigh the merits of several possible locations for the building of a dam, or to consider more than one design. In other cases, members were asked to consider whether emphasis on flood control or on irrigation would best serve the purpose of the project.

Future considerations in the field of water resources promise to entail more gigantic engineering ventures and to have a higher price tag. Such schemes as taking Feather River water from northern California to Los Angeles to use for domestic and industrial purposes, and the dreams of taking surplus Columbia River water down into the Southwest or of taking the surplus Mississippi River water and using it West of the 98th meridian, are all projects which may sometime be considered. Also, the future will probably bring the processing of sea water for municipal and industrial use. Even now we hear much highly technical testimony about the experimental processes, which offer some indication that sea water will be a source of supply in the not too distant future.

All of these projects dealing with water, one of our most important natural resources and one which is becoming more and more precious as the nation grows, call for the background which the engineer possesses.

Along with the development of hydroelectric and atomic



This engineer with the Department of Reclamation in Denver is typical of the hundreds of engineers who carry out government business. The Congressman must understand the complex jobs done by these men and their agencies.

The government works closely with industry in hundreds of projects involving engineering. In the photo, Bjarne Klaussenm, president, left, and Allan P. Walker, department head, Hooker Electrochemical Co., hold 2.3 pounds of isotope boron-10, valued at three times the price of refined gold. It is produced for the Atomic Energy Commission and is used for such jobs as a shield against atomic radiation.

power, we have before us great possibilities of power from two other sources—sunlight and the tides. The many technical problems to be considered in their development may all have to be discussed around the conference table in the committee rooms. If so, committee members will try to understand complicated technical problems such as the intermittent nature of these energy supplies and the most economical type of supplemental power.

Only the great expenditures for war and defense have exceeded the amount the United States will spend for the development of a national system of interstate highways and related works. The Highway Act authorized nearly $25 billion of Federal funds over the next thirteen years for 41,000 miles of high-speed expressways. The state matching requirements will add another 2.5 billion. This is frequently called the $100 billion program, if one includes all estimated Federal, state, and local road construction during the 13-year period.

The responsibility for including all of the safety features of highway construction in writing up the legislation was an important one for the Congress. Members acted upon the advice of the experts in determining the maximum size and weight of the vehicles that could use the system; in prohibiting commercial establishments on the right-of-way; and in setting the standards of construction of roads, bridges and tunnels. The committee listened to much expert testimony when considering the provision for limited access in the interest of safety and preventing obsolescence. Highways of the future will be even more complicated, and the congressional committee considering public roads would greatly benefit from the presence of an engineer.

Another field for which Congress must appropriate a great amount of money and about which it has all too little understanding, is that of airpower research and development, with its jet planes, research projects on guided missiles, space satellites, and perhaps in the not too distant future, rockets to the moon. Last session, the appropriations for the Air Force for aircraft and for research and development totaled $14,740 billion. Naval aviation appropriations also ran into the billions of dollars and the Civil Aeronautics Administration, the Civil Aeronautics Board and the National Advisory Committee for Aeronautics each received appropriations running high in the millions.

WHILE it is difficult enought at the present time for the legislative and also the executive branches of the Government to keep abreast of the technological developments in aviation, many of the future explanations will be way beyond the understanding of anyone who is not a scientist or engineer. The last Congress, concerned over the air traffic control system, appropriated additional money to eliminate, as far as possible, the weaknesses in our aviation facilities. The estimates have been consistently low in determining the number of planes, the number of flights, and the speed and performance of aircraft; and, consequently, our traffic control facilities are greatly outmoded. Perhaps an engineer, who could appreciate the critical problem of the nation's crowded airlanes, would have been less anxious to cut the Civil Aeronautics Administration's requests for money. They have been drastically trimmed in recent years, in spite of the magnitude and importance of this problem, with which we are already confronted.

This session, the congressional committees concerned will be listening to proposed remedial measures which will include discussions of an electronic-controls system in the traffic control centers, greater use of radar, and development of automatic alarms to notify pilots of approaching planes. An aerial "superhighway" network, with certain routes reserved for planes of similar speeds, will be explained in detail. There will be few, if any, on these committees with a background especially equipping them to understand and assess this technical information.

I have highlighted some of the topics which have come up before Congress and have indicated some of the issues

(*Continued on page 45*)

About the Author . . .

Rep. Anderson

U. S. Representative LeRoy Anderson, was graduated with honors from the Department of Chemical Engineering at Montana State College in 1927. From 1936 to 1938 he spent eighteen months in research at the California Institute of Technology. His advanced study was on "Molecular Associations of Osmium Tetraoxide in Aqueous and Carbon Tetrachloride Solutions." The results were published in the Journal of the American Chemical Society. Bell Telephone Company offered, through its research laboratories, to finance further research along these lines, but at that point it became necessary for him to return to Montana and assume operation of the family farm. Anderson is a member of Tau Beta Pi, national engineering honorary fraternity. He served for a decade in the Montana State Legislature and was on the Appropriations Committee, which determined needs for the Greater University system of his State. During World War II he reapplied his engineering training as a commander of an armored force in Europe, and subsequently after the war became commander of an infantry division as a reservist. He now is a Major General in the Reserve and as commander of the largest unit of its type in the nation has added need for application of his engineering training to the solution of signal, construction and other military engineering problems. He was elected to Congress as a Representative from the Second District of Montana in November, 1956.

Engineering Employment Practices Digest

A short digest of a monthly bulletin published by the National Society of Professional Engineers in the interest of advancing cooperative relations between professional engineers and their employers. To regularly receive the complete publication which is distributed widely to industrial, commercial and educational organizations, write the NSPE, 2029 K St., N.W., Washington 6, D. C.

✓ **Engineers at Puget Sound Power & Light Co., Bellevue, Washington, have voted against union representation 24 to 15. The organizational attempt was by the Seattle Professional Engineering Employees Association, affiliated with ESA. Latest developments in the split among the engineering unions shows The Engineers Association at Sperry Gyroscope voting to leave ESA, and the TVA Engineers Association executive board voting for disaffiliation, subject to a membership vote.**

* * * * *

✓ *The Bureau of Public Roads has withdrawn its recommended contract clause which would have forbidden consulting engineers from hiring engineers who were or had been in the employ of the Bureau, or the highway department of any state, county, or city, without written permission of the public employer. NSPE President Dyer hailed the BPR action, stating it will "strengthen the confidence of the engineering profession in the Bureau and aid in bringing about closer and more cooperative relations." The NSPE Board of Directors requested withdrawal of the clause last February, declaring it would freeze highway department employees in their jobs, or force them out of the highway program, and would discourage young engineers from accepting positions with highway organizations. The BPR statement emphasized the policy of adequate salaries for highway department employees. This was the major line taken in the NSPE statement — that the proper solution of the problem was to recognize and act on the salary differential between highway department engineers and those in private employment. Also in line with NSPE policy, the Bureau said it is necessary on occasion to employ consulting engineers for projects requiring special technical skills and when a highway program is being expanded rapidly. President Dyer said this was in line with a recent NSPE resolution, but cautioned consulting engineers they must comply with the BPR warning that the consultant must be organized and have the manpower to perform the job promptly.*

* * * * *

✓ The Los Angeles Board of Public Works has stopped the attempt of the American Federation of Technical Engineers, AFL-CIO, to attach the union label to engineering and architectural plans and documents filed with city officials. The Board said plans and documents would not be approved if they bear any data, material or insignia not directly pertinent to the construction, and the identification and professional status of the persons responsible for their preparation. Professional groups, including the California SPE, opposed the union move.

* * * * *

✓ **A recent book, *The Demand and Supply of Scientific Personnel*, by economists David M. Blank and George J. Stigler, published by the National Bureau of Economic Research, has generated a new discussion on the "shortage." The authors say it is "doubtful" that at any time has there been a "severe shortage of engineers." They contend in a detailed analysis that engineering salaries have drifted downward in relation to salaries of others. Employers, according to a recent survey, generally agree that the worst of the "shortage" is over, but are hesitant to speak out publicly for fear of causing a heavy slump in engineering school registrations.**

* * * * *

✓ *Salary ranks seventh in a list of factors influencing young engineers to select their first employment according to a McGraw-Hill survey. Among 2,596 recently-employed engineers in fifty-seven companies the more important factors were potential growth of company, challenging opportunity and company's prestige and reputation.*

* * * * *

✓ The first of a nation-wide series of utilization clinics will be held Sept. 5-6 in Charleston, W. Va., under auspices of the President's Committee on Scientists and Engineers. The West Virginia SPE and University of West Virginia are sponsoring the event. Similar meetings will be held in Houston, Sept. 12-13, at Pennsylvania State University, week of Sept. 16 and in Boston next Fall. NSPE has compiled a 74-item bibliography on utilization of engineers which is available upon request.

* * * * *

✓ **A technical writer has been held exempt under the Wage-Hour law as a professional employee by a Federal District Court in California. He had sued for time-and-a-half payment for hours over forty per week. The Court held, however, that his application of engineering data and exercise of judgment and discretion brought him within the professional-exempt category.**

* * * * *

✓ *Charges that defense contractors pirate Government engineers with Federally-paid help-wanted advertisements have been challenged by the National Security Industrial Association. The industrial group says the charge is unsupported by the meager evidence presented, but suggests voluntary action by industry and Government to meet the problem. Industry should avoid lavish use of space and not beam their ads toward employees of competitors or of the Government, it is suggested. "Pirating" should be avoided, it is added, "but this is a delicate point (and) we do not advocate any abridgement of an individual's freedom to work for the employer of his choice or to improve his economic lot."*

A Logical Alliance —Engineering and Religion

By

DEAN C. J. FREUND,

College of Engineering, University of Detroit

JUST why should the editor of the AMERICAN ENGINEER publish an article on religion? We engineers have to do with steel, oil, concrete and aluminum; with pressures, temperatures and dimensions. We can't build machines or structures out of sermons and bibles.

Mr. Trombley has not told me why he is running this article. But I can think of a number of reasons why I should run such an article if I were editor.

We call this the age of technological progress. Engineers are the prophets of this progress. But engineers must keep their feet on the ground. They must realize that engineering advance is not the only thing that's going on in the world.

One of the things which are going on is a renewal of religion in the United States. Evidence of this renewal is all about us.

Two or three years ago, on a Monday afternoon, I sat with a young man in a dining car between Detroit and Chicago. He was a student at Seabury-Western Theological Seminary of Evanston, Illinois. He explained that he was often in Detroit on Sundays to help out the pastor of one of the churches there.

"I admire your devotion," I said to him. "You must have a lot of it because I suspect that opportunities for clergymen are rather limited, and their pay not too high."

"It is not that way any more," he answered. "New churches are going up all over and all congregations are growing. There are not nearly enough preachers to go around. All our graduates can choose from a number of positions, and the salaries are really pretty good. None of us feel that we are making much of a personal sacrifice in this profession. Times have changed in the past ten or fifteen years."

At a luncheon in Detroit, not long ago, I sat next to the keen, youngish president of a steel supply company. In the university he had specialized in marketing and economics. But before going to the university he had completed a course in theology. I asked him if he had intended to be a clergyman. "No," he replied. "I had a good look around. That made me sure that an understanding of religion would prepare me better for life and career than anything else I could think of."

Anybody can observe such evidence of renewed religious interest. And there are data to support one's observations. Will Herberg (a physicist, by the way) has assembled such data in his *Protestant, Catholic, Jew*.[1] He reports that the American population grew by 28.6 per cent from 1926 to 1950, but American church membership grew by 59.8 per cent during the same time.

He quotes from a survey by Elmo Roper. In 1942, 17.5 per cent of Americans thought that religious leaders were "doing the most good." In 1953, forty per cent of the people thought so. Mr. Herberg concludes that:

> . . . the "minister of God" ranks high, and is rising rapidly, in the American scale of prestige. This rise of public confidence in clergymen no doubt reflects the rising status of religion and the church in American social life.[2]

PRESIDENT Eisenhower told the World Council of Church in their assembly not long ago that "the percentage of our population belonging to churches steadily increase. In one hundred years that percentage has multiplied more than three times."

McCall's magazine is currently running a serial, "The Day Christ Died." The circulation of this magazine is enormous. The editor would certainly not publish this

[1] Garden City, N. Y.: Doubleday and Co., 1956. P. 60.
[2] Ibid., pp. 64-65.

The author believes that religion should and does enter into the daily living of the engineer whether he is simply taking part in community activities or designing a huge building.

New York City community leaders look over a letter from Mayor Robert Wagner discussing the program for "A Quiet City." The important project, greatly dependent upon engineers, is an excellent example of "ministering to the people."

serial if the American people had no concern for religion. Possibly this same *McCall's* magazine published articles no more than twenty years ago which referred to religion as "outmoded superstition." At that time sophisticated people were proud of their indifference toward, or even contempt for clergymen, doctrine, rites, everything that pertained to churches. But there are no more attacks upon or even sneers at religion. Gone, too, is the military agnostic or atheist. There may be people today who think like Robert Ingersoll or Clarence Darrow, but if there are, they keep their thoughts to themselves. They dare not flout public opinion.

It would probably be impossible to discover all the reasons why Americans are taking a renewed interest in religion. One powerful reason is doubtless because they are afraid: afraid of Russia, of communism, of nuclear bombs. They are afraid of modern warfare. There is an immense and disturbing difference between the horrible "death march" of American prisoners of war from Bataan, and Robert Lee's soldiers going home from Appomattox with their horses, because Grant said (if he really said it) that they "would need them for the spring plowing."

What does this far reaching "about face" of American people mean to professional engineers? Before trying to answer that question, we had best agree on what we mean by religion. Religion, of course, means different things to different people; and may mean different things to the same people under different circumstances. I am not qualified to write a formal and philosophical definition of religion. But for our purpose it is sufficient to assume that religion means to worship God, and to recognize one's duty to please Him, either because He is supremely good, or because He will reward or punish. By religion we mean something more than to dress up on an occasional Sunday and listen to a popular preacher in a fashionable church, only because our neighbors are doing the same thing.

Now what about engineers and religion? Over and over we engineers have heard, and have told each other, that we must understand the civilization in which we live and work. We "minister to the people," to borrow from Vannevar Bush. But how can we intelligently minister to the people if we don't appreciate how they live and work, what they need and what they hope for? We can't serve them if we tend strictly to engineering business and don't try to comprehend their aspirations. One of the most significant aspirations of the American people is religion.

Besides, any engineer who can see beyond the limits of his day's task will not be content unless he has a satisfying motive for his work and his profession. Religion can be such a motive. The engineer can serve the Creator while he ministers to the people. To quote Hugh Taylor of Princeton University:

> Something will have escaped us if we fail to recognize, beyond the material considerations, something in the word that goes back to its Latin roots: *sacrum facere*, in making sacred our daily effort and toil in the laboratory, the lecture hall, the factory, or workshop, we can achieve the unity of life and the faith in the future that are essential for well-being.[3]

So far we have been talking about religion as a strong, revitalized force which is stirring the American nation. We have said that engineers must recognize this force, and must take it seriously in their thinking, working and living. But religion means even more than that to engineers. Religion can be a personal guide to them as professionals. Religion can, and doubtless should, enter into many of their day by day decisions and actions while they design and build automobiles, airplanes, water systems, locomotives, or any other technological device or facility.

The engineer must not only produce efficient machines and structures, but while he is creating machines or structures he must be ethical toward employers or clients, subordinates, fellow engineers, suppliers and vendors, and the general public.

Some engineers will tell you that they have nothing to do with the right or wrong of their projects. They say that their job is to design a jet engine or projectile, or to produce toxic gas. They contend that the use which the client or employer will make of the engine, projectile or gas is none of their business. The engineers who designed and built the execution facilities at Dachau for Adolf Hitler must have subscribed to this philosophy. To most of us Americans this does not make sense. We hold that the engineer must assume at least some share of responsibility with the owner and the user, although we grant that he may not be able to control the use of machines or structures, especially after they have completely passed into the hands of the owner.

In any case, American engineers are thinking and talking about engineering ethics. Indeed, their concern about ethics is growing in parallel with Americans' concern about religion.

In February of this year, the National Society of Professional Engineers devoted an entire day to questions of professional ethics in their meeting at Charleston. The Engineers' Council for Professional Development scheduled a session on ethics during their 1956 annual meeting at Detroit, and during the meeting at Toronto the year before. It should be explained that the annual meetings of the Engineers' Council for Professional Development do not feature a great number of sessions on a variety of subjects. These sessions on ethics were practically the only organized, formal conferences in addition to the main or general events of the annual meeting. And practically all important engineering societies and associations have committees or boards on ethical standards and practice.

Why all this discussion about ethics? The reason is that there is a close connection between ethics and reli-

[3] "Physical Sciences," in *Religious Perspectives in College Teaching* by Hoxie N. Fairchild. New York: The Ronald Press, 1952. P. 234.

gion. Ethical principles and directions are not religious. They derive from philosophy and experience. But it takes more than principles and directions to make an engineer ethical. He must have within him a compelling motive which will make him comply with principles and directions. Engineers are proud of their scientific method of approach. But science cannot motivate them to be ethical. Indeed, science cannot even provide standards or norms of ethics. To quote again from Hugh Taylor:

> The data of astronomy, biology, chemistry, geology, mathematics or physics have little to tell us concerning the regulation of human conduct. These sciences provide answers as to observed behavior; but they do not answer the question whether such behavior is right or wrong. The whole area of ethical judgments or conclusions lies outside the province of these sciencies. They cannot answer the question: should I do this; ought I do that?[4]

The Committee on Ethics of the American Society for Engineering Education reported to the Society in June, 1953, that the Golden Rule, Western tradition, the Natural Law and religion are all acceptable norms for ethical conduct. About religion, the Committee had this to say:

> Religion may well be the strongest motive for right conduct. All religions of the Judaeo-Christian system prescribe the Ten Commandments. There are people, of course, who deport themselves correctly without subscribing to any form of religion. But if the experience of centuries means anything, the great majority of religious persons can be depended upon to be ethical. To worship the Creator, and to have a high regard for one's fellow man as the likeness of the Creator, seem to have inspired most of the personages whom history recognizes as especially high minded and ethical. Men who have all their lives been members of religious denominations invariably and justly are expected to be upright in their dealings with fellow citizens. In fact, this is so much the case that it is considered especially disgraceful when a church member fails to live up to accepted ethical standards.[5]

Engineers, in my view, should be concerned about religion because they should worship the Creator. Of course, all men should worship the Creator. In addition, however, engineers should be concerned about religion because religion is a strong force to support engineering ethics. And engineering ethics is the very foundation stone of engineers' professional status and value.

ENGINEERS do thrilling things. At least lay people think so. Engineers often think so themselves. A thoughtful citizen is appalled by a mighty waterfall, a great conflagration, a severe electric storm or a tornado. He is terrified by the forces of nature. The engineer is described to him as one who captures these forces, subdues them, controls them and puts them to work in the service of the people. Such a man is a wonder-worker to the ordinary citizen.

Most engineers are modest men; in fact there are those who insist that they are too modest. But there is at least a danger that they may believe that control over the forces of nature is the answer to all the problems of the human race. Some engineers already think so. They express, or at least imply, their thinking in what they say and write.

Thirty years ago scientific and the technological supermen were to take over the world and straighten out the mess. Science and engineering were not only to save the world but were to convert it into a glamorous paradise. The supermen did take over but they made a mess of it. They started out confidently and arrogantly, but after a devastating World War and the violent death of millions of men and women, they retired in some confusion, and haven't been heard from since. They could build, and they certainly knew how to destroy, but they were utterly unable to recreate the souls of men.

The engineer controls the forces of nature, but he needs to realize that there are some things he can't do, and shouldn't try. He needs to know his place in the scheme of things. He must be careful not to make a fool of himself. He can make good use of a generous supply of wisdom and poise, and an all around sense of proportion. And there is nothing quite like the worship of the Creator to impart wisdom, poise and an all around sense of proportion to an engineer; indeed, to any man. The engineer who recognizes that a Providence rules the world is not likely to undertake any project which has within it the ingredients of disorder or catastrophe.

The logic of this discussion seems to have held together fairly well so far. At least I think so. If the logic is sound, we probably have to accept the conclusion that the colleges and schools of engineering ought to teach religion. If there is one principle which engineering educators have accepted for years, it is that they should teach at least those things which students will need in life and in practice, and which they cannot learn after graduation. Certainly, religion is such a thing. A young graduate will never attend lectures in religion as part of his postgraduation training or apprenticeship at General Electric, Westinghouse, DuPont, Lockheed or any other important engineering corporation. Neither will he learn religion in a small specialized manufacturing shop or consulting office.

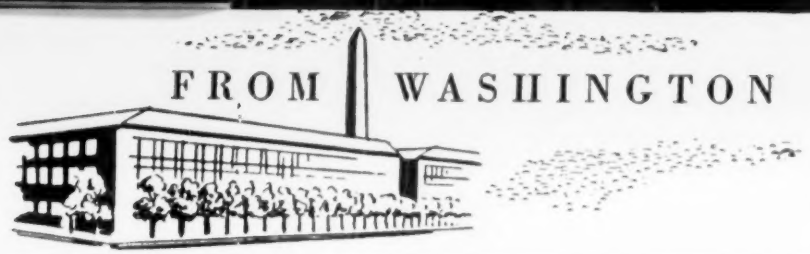
BUT before the college faculty can teach religion, they must answer a number of perplexing questions: Of all religious systems or sects, which shall the faculty accept and teach? Of shall they teach some sort of integration of all the sects? What engineering subject matter shall they eliminate from the curriculum in order to make room for the courses in religion? Shall religious instruction be compulsory or optional? Should religion be taught in formal

(*Continued on page 41*)

The author believes that engineers must feel the right or wrong of their projects. Here engineers at the Philadelphia Gas Works inspect a complex device which maintains a 24-hour watch for combustibles in the atmosphere.

[4] Ibid., pp. 221-22.

[5] "On Engineering Integrity," *Journal of Engineering Education*, XLIV (December, 1953), 228-29.



FROM WASHINGTON

By
Milton F. Lunch,
N.S.P.E.'s Legislative Analyst

SECOND THOUGHTS ON THE SHORTAGE

WHAT has happened to the hue and cry to establish some type of urgent Federal program for the production of more engineers and scientists? It was only last year, for instance, that a congressional subcommittee reported "we are headed for defeat because of the diminishing number of those needed to carry the scientific and engineering load upon which technical progress depends." Another congressional group reported that the technical assistance program for underdeveloped nations was floundering because the U.S. did not have enough engineers, scientists and technicians to export. Leading members of Congress talked about "immediate action," "crash programs," "national danger," etc.

Dozens of bills have been introduced to put the Federal Government into the business of producing more engineers and scientists, largely through scholarship grants or loans. None of them have been acted upon, and it appears quite likely that all such proposals will be pigeonholed. The most obvious reason for this contradictory situation can be attributed to the desire not to undertake new expensive programs at a time of great budget stress and strain. But it can be questioned whether the tight budget situation is the real reason if the engineer-scientist supply presents as great a danger to the nation as many responsible and informed members of Congress said it does.

What has apparently happened to the demand for swift action is the "second thoughts" process and a realization that the "shortage" problem could not be licked simply by large grants of Federal funds. While the number and intensity of impassioned pleas for Federal action have diminished they have not ceased altogether. The *Congressional Record* still contains periodic speeches on the subject along more restrained lines. Now the speeches are more apt to recognize the enormous complications and the intertwined relationships of mathematics and science teaching in the high schools, low teacher pay, adequate college facilities, the relationship of technicians, morale and prestige factors, the implications of defense spending on demand, and other similar factors. The legislators are not so prone to offer the pat solution of merely providing a certain number of Federally-financed scholarships.

Also emerging with this development is a somewhat subtle questioning of the validity of the shortage. Was it as bad as first proclaimed? Is it a severe problem now? And do we run the risk of stimulating young people into technical careers with any reasonable assurance that we will not create an oversupply? Significantly, much of the output from official Washington has lately been geared to an emphasis on improved utilization, rather than an increase in numbers. During the height of the shortage fever the White House appointed a National Committee for the Development of Scientists and Engineers. Now that body's name has been changed to "The President's Committee on Scientists and Engineers," with the explanation:

> "The Committee has found that the original name has been interpreted as limiting the Committee's function to educational problems. While education continues to be a major long-term concern, the Committee is engaged also in such short-term activities as improved conservation of engineers and scientists, better utilization of technicians, on-job training, upgrading, and other steps to make fuller use of the Nation's available trained manpower."

Governmental interest in engineer-scientist supply is likely to be influenced directly or indirectly by the recent book, *The Demand and Supply of Scientific Personnel*, by David M. Blank and George J. Stigler, published by the National Bureau of Economic Research under a grant from the National Science Foundation.

The authors, both economists, delve exhaustively into the statistical evidence on demand and supply and conclude that it is "doubtful" that at any time there has been a "severe shortage of engineers." They buttress their finding with a detailed economic analysis which shows, they contend, that engineering salaries actually have drifted

(Please turn the page)

downward in relation to salaries of others, and the decline has been especially pronounced since 1939. As economists, they contend that under fundamental economic principles increases in demand relative to supply will manifest themselves in rising prices. The same thought has been put in less formal terminology as: "I know there is a shortage of coffee because the price has gone up. The price of engineers has not gone up, therefore, I know there is not a shortage of engineers." Whether the Blank-Stigler conclusions are sound or not (and they admit the lack of adequate definitions and statistics on key points), their work is receiving extensive public notice through syndicated columns, articles in leading magazines and other sources.

A further recent study with regard to the shortage flows from a request by Senator Hubert H. Humphrey of Minnesota to the Library of Congress for a more exhaustive

Senator Hubert H. Humphrey
Of Minnesota

treatment and analysis. The result is a 172-page report, "Development of Scientific, Engineering, and Other Professional Manpower (With Emphasis on the Role of the Federal Government)" by Charles A. Quattlebaum, specialist in education of the Legislative Reference Service. In asking for this study, which has been published by the Congressional Joint Committee on Atomic Energy, Senator Humphrey said the subject "merits a high priority for national attention and certainly will be a subject of acute interest in the 85th Congress." That "acute interest" has not developed to date in terms of legislative action, but the new report is nevertheless of considerable value in the present re-evaluation.

The Quattlebaum report is primarily factual and not nearly so provocative as the Blank-Stigler book. But it does point up some of the questionable areas about the shortage and particularly whether the situation is such that Federal action is warranted. Quattlebaum observes, for instance, that "there is some evidence that our shortage of professional scientists and engineers may not be as great as our shortage of subprofessional technicians, though there is a lack of general agreement concerning the meaning of these terms." At another point he notes in connection with legislative proposals for Federal loans to students that loan funds available to students in many institutions of higher learning are not being fully used. "Whether Congress can devise a loan plan to persuade financially needy young people of superior ability to attend college in their own and the national interest is open to question."

It would be misleading to imply that the Quattlebaum report is "anti-shortage" or that it necessarily opposes Federal action. The reader is almost bound to conclude, however, that there are many unresolved doubts and questions about a Federal program and a myriad of gray areas of great complexity in a field which has heretofore been treated largely in the "black and white" atmosphere

In reporting to the Senate on his request for the Quattlebaum report Senator Humphrey, who has been one of the leading congressional students of the manpower picture, dealt at great length with the means which can be used to improve the utilization and job-satisfaction aspects of the presently available scientific and engineering manpower. In his remarks and insertions mention was made of the need for more supporting technicians, an incentive pay system to hold engineers in government against higher offers from industry, improved prestige, better physical working conditions, adoption of a career ladder which will not force engineers and scientists to become administrators to reach the top grades, and many other items of this type.

It is fairly clear that the shortage scene from the congressional viewpoint has now shifted to the extent that no precipitate action will be taken. Meanwhile, there is the hope and possibility that Congress will take some steps to improve the morale, prestige and pay factors of Federally-employed engineers. Recently, House Majority Leader John W. McCormack said that the "most important step that should be taken at this time, to stop or reduce this great loss of intellect, knowledge, and skill, is to establish supergrade positions under civil service by setting up separate scientific and professional civil service classifications, so that these superior men may obtain salaries commensurate with their abilities and responsibilities." This has been one of NSPE's major recommendations to Congress and the Society complimented the Majority Leader for his statement, pledging full support toward the goal he enunciated.

Are Engineers Throttling Science?

By
S. S. PODNOS,
Special Assistant to the Deputy Assistant, Secretary of Defense for Research and Engineering

I HESITATED at first to write about the topic "Are Engineers Throttling Science?" This is the type of subject that people write about and talk about without really conveying what is meant and what they mean. The topic is vague. And the resulting battle of words and their meaning only serves to further confuse the public, the very recipient we are all seeking to inform correctly. But the very vagueness of the topic was a challenge to me. I felt that anything I could do towards its clarification would render a service by resulting in better understanding.

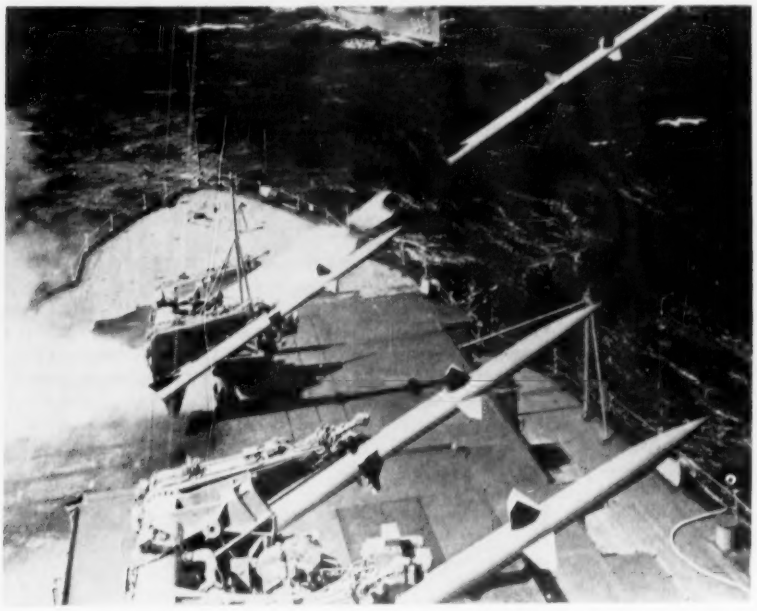
Many of us are inclined to accept what we read or hear without question. Most of us are too lusy or don't have enough patience to analyze and "think through." As a result we often forget what things are based upon. We remember how to multiply long after we have forgotten that multiplication is based on addition. With this in mind, I will dissect the subject, piece by piece.

The boundaries of science are without limit. Basically, science has to do with those things you cannot touch, those things having to do with nature, and those things having to do with life. These are called the abstract sciences—such as mathematics, the natural sciences—such as physics, and the human sciences—such as sociology. Science is almost "all things to all men." One might also add, that science is based upon common sense.

But it should be noted that engineering is a part of science. In fact, the problems of science at the human level have been called engineering ones. They have been labeled physical engineering, biological engineering and human engineering. These are also called the applied sciences. In recognition of these, groups devoted to science, such as The National Academy of Sciences, and the American Association for the Advancement of Science, of which I am a member, have engineering sections. It is obvious that engineers have no cause to throttle engineering.

We all know that one who works in science is a scientist. It is not well known that the term "scientist" includes the engineer. It may be of interest that in the British Isles today all professional engineers are scientists. However, in this country there is an increasing tendency, by use, to disassociate the terms "scientist" and "engineer," perhaps because of our nonprofessional use of the latter term for tradesmen that attend boilers, locomotives and the like. This has been accompanied by a growing tendency to associate the term "scientist" exclusively with the non-engineers in research. As such the research scientist does scientific research. From the foregoing it would appear that the topic of this discussion should have been "Are Engineers Throttling Scientific Research?"

Now let us consider engineers. Whereas science is a type of activity, engineers are people. As people they are free to pursue any course of activity, and they do. I'll venture that there are more engineers engaged in scientific research in this country than the members of any other sin-



Engineers and scientists working together. Here are tests being made on the Terrier guided missiles conducted at sea aboard the U.S.S. Mississippi.

The "Forward Look": a paratrooper jumps from the new H-21 helicopter.

gle profession. Their educational background has trained them to have the same vision and imagination, so necessary for this activity, as possessed by all other scientists. Many engineers are engaged in the design and development of items for use. Others are engaged in sales management, motion studies, testing, construction, and a host of other activities. An appreciably lesser number are engaged in production engineering and production—the "nuts and bolts" activity also so necessary to our way of life. However, to imply that all engineers are "nuts and bolts" people, as has been done recently by those that seek to mass inform the public, is an insult to the engineering profession.

I AM a good example of what I am writing here. I hold a degree in science. As a graduate I instructed two college laboratories in a senior physical science course, and simultaneously performed work in basic or pure research. Within my experiences I have also spent many years in engineering development, production, and maintenance working with the automotive, metals, and ordnance industries. In the position prior to the one I now hold, I received recognition for achievements in applied research. And I am a licensed professional engineer in the District of Columbia.

Engineering, on the other hand, while it is a profession and a system of training, is also a type of activity. As a system of training, and as a profession which participates in research as a normal course, it can have no cause to throttle scientific research. However, as an activity it is one of the links in the systematic chain of events from basic research to production. This could be the only possible conflict with scientific research. It will therefore serve to clarify the topic of this discussion by changing it to "Is Engineering Throttling Scientific Research?"

This question has been given considerable publicity due to the consolidation at the staff level of the Office of the Secretary of Defense, of the two positions of Assistant Secretary of Defense for Research and Development, and Assistant Secretary of Defense for Engineering, into the one position of Assistant Secretary of Defense for Research and Engineering. There has been serious misunderstanding about the reasons back of this change and some erroneous accounts have appeared in the press. However, an explanation of these reasons will serve as an answer to the question "Is Engineering Throttling Scientific Research?"

In the reorganization of the Office of the Secretary of Defense in 1953, two separate assistant secretaries of defense were established, one for research and development activities, and one for engineering activities. The main purpose in establishing two offices was to provide effectively for adequate attention to both scientific research and engineering. Since I have been with the engineering office almost from its inception, my observations are based upon personal experience.

Almost immediately the question arose about the specific activities that were the responsibility of each office. To define these responsibilities, fruitless discussions ensued as to what was research and what was development, and how each fit into the transition of materiel from exploratory work to production. I will discuss these two briefly to give you a better picture of the situation.

Testing for the future, an army officer flies the one-man helicopter.

Left: The F-104 Starfighter is ground tested at night.

Below: A mushroom cloud formation from history's first atomic artillery shell can be seen rising in this photo. The atomic shell burst in the air with a precision accuracy.

Research consists of two phases, basic research and applied research. The latter is also called exploratory development. Basic research reveals new knowledge. Applied research or exploratory developments, show how this new knowledge can be applied to attain desired devices. As such in applied research we demonstrate the feasibility of a new principle, idea, or device. This is accomplished by paper studies, experimental models where the art is not well defined, and the like.

Engineering on the other hand, is to evolve an item for use, and consists of three phases: the development of the design, the development of the prototype, and the development of manufacturing type tooling and processes based upon the item to be produced. This last phase also includes the manufacture of a pilot lot of the item for operational or user tests and approval by the user. While not pertinent to this discussion, it is of interest that production of an item for inventory and use, in the ideal case is conducted after approval of the item by the user based upon operational tests. When we ask whether an item is well engineered, we want to know whether it is satisfactorily developed up to the point of production.

Development is a two horned animal. The first horn is that of exploratory development or applied research. The second horn is engineering, or as it usually is called, engineering development. It is important to note that applied research is concerned with what can be done, while engineering development is concerned with what will be done.

In between applied research and engineering we have a management phase which includes the analysis of what came before and a plan of activity for that which follows. This is the normal point to weed out and select materiel, for this is the point past which large expenditures are necessary. It is not overly expensive to have multiple approaches in applied research. In fact, in terms of pay-off it can be very worthwhile. In engineering development, however, costs rise rapidly because hardware is being built for the many tests required. It is therefore of great importance to narrow down the field in this in-between phase, or if not possible at this point, before the engineering

(Continued on page 45)

A Matador pilotless bomber takes to the air at the test center in Cocoa, Fla.

(*Continued from page 5*)

nouncement stated it ". . . has always recognized that on occasion there would be need to employ consultants for projects requiring special technical skills and even for less difficult projects when a program is being expanded rapidly."

"In welcoming the Bureau's cooperative action," Mr. Dyer added, "the engineering profession should bear in mind its obligation for the success of the highway program, and support the policy of the Bureau that consulting engineers should be not only qualified technically but be organized and have the manpower to handle the work with necessary promptness."

Letters

(*Continued from page 4*)

is understandable since no group is willing to recognize the problems of the engineer in industry and make an honest attempt at solution.

It is perhaps unfortunate that trade unions wield a tremendous amount of political power, and are able to influence state and national legislation. Up to the present there has been no attention paid to the legislative barriers which protect the unwilling professional from being included in their ranks. One can only guess as to the result of a determined program to remove these barriers.

It is also unfortunate that unions exert a great amount of economic pressure, and through collective bargaining agreements are successful in bettering the pay scale of their membership. Wage patterns throughout entire industries must be adjusted to absorb this increased cost of doing business. Prices of industrial products must be advanced to defray the additional expenses.

On top of his other woes, the industrial engineer has to contend with a fast shrinking demand for his talents. In the past, defense cut backs were followed by lay-offs of engineers. Up to now, there has been no policy advanced to cover this contingency.

It is no wonder that a negative philosophy is being developed since the engineer can look to no single group for his legislative protection and economic well being.

ROBERT P. GOLDSTEIN, P.E.,
Pittsburgh, Pa.

P.E.'s and Roads . . .

Dear Editor:

I wholeheartedly agree with A. C. Friel, P.E., (June, 1957, issue of AE) that the election of a non-registered engineer as State Highway Commissioner in Michigan represents "one of the most damaging challenges ever made to the whole registration structure." If there is any one individual with more reason to be a registered professional engineer than the state highway commissioner, I can't imagine who it could be. This man is supposed to be the channel through which all highway matters are passed. How can he adequately supervise the work of his subordinates in the state highway department if he himself is not qualified by registration?

If a state has a law requiring registration on the part of engineers who sign their names to plans for public projects, how can that state permit a non-registered individual to administrate over the affairs of the highway department?

Mr. Friel and his associates in the Michigan SPE are to be congratulated for taking steps to remedy this unfortunate situation.

MILFORD J. MEFFEI
Portland, Oregon

New NSPE Salary Survey Now Off the Press

Young Engineers, chemical engineers, and engineers in education have achieved the largest gains in total earnings over the period 1952-56, and engineers employed by Federal agencies have made the smallest gains.

These are some of the findings drawn from the latest "Professional Engineers' Income and Salary Survey" published by NSPE.

The Survey, third in a series started by the National Society in 1952, is based on an analysis of 17,000 questionnaires returned from registered professional engineers in all the technical branches.

The Survey shows an increase of twenty-one per cent in the median earnings of engineers during 1952-56, as indicated on the questionnaires returned. The median salary and income figure for the engineers responding in 1956 was $9,490, as compared with $7,850 in 1952.

The competition among employers for recently graduated engineers is reflected in the percentage increase in earnings for this group. Engineers at grade 3, a pre-professional level, were found to have had an increase in earnings of twenty-eight per cent from 1952-56, a higher increase than was noted in any of the other grades.

Chemical engineers had a median earning total of $11,000 for 1956. Civil engineers had the lowest median earnings of any of the major branches with a figure of $8,750. Other median earning figures for 1956 were: electrical, $9,160; mechanical, $9,730; mining and metallurgical, $10,000.

The greatest increase in earnings, dollarwise, was reported by engineers connected with educational institutions, with those engaged primarily in teaching reporting the greatest percentagewise increase. Engineers in public utilities reported the second highest dollarwise increase, while engineers in industry reported the third highest.

For all groups except state government employees, greater increases were obtained between 1951 and 1956, than over the preceding two-year period.

Engineers employed by the Federal agencies showed an earnings increase on the Survey of twelve per cent from 1952 to 1956. This increase trailed well behind percentage increases for the same period in industry, public utilities, education, state government, and county or municipal government.

A statistical breakdown on over-all earnings of engineers in 1956 shows that ninety per cent of those replying to the Survey questionnaire earned at least $6,390, as compared to a figure of $5,570 for ninety per cent in 1954. The 1956 Survey also shows that ten per cent of those replying earned at least $19,360. In between these two groups, the 1956 Survey shows seventy-five per cent of the respondents earning at least $7,510; fifty per cent earning at least $9,190; and twenty-five per cent earning at least $12,340.

On a regional basis, the 1956 Survey showed engineers in the East Coast states enjoying the highest median earnings. However, a comparison of the 1956 and 1952 Surveys indicates a narrowing of the regional gap in median earnings. In 1952, the median income of East Coast respondents was $1,130 higher than in the South, and $1,400 higher than on the West Coast; in 1956, the East Coast was still highest, but the difference had come down to $880 and $1,160 respectively.

The biennial Surveys are a part of a long-range income and salary study program for the engineering profession undertaken by the National Society.

Copies of the 1956 "Profesisonal Engineers Income and Salary Survey" may be obtained for 50¢ from the National Society headquarters, 2029 K Street, Northwest, Washington 6, D. C.

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- Which of the major engineering specialties has the highest median earnings?
- In what fields have professional engineers achieved the largest gains in total earnings over the period 1952-56?
- How do engineering salaries compare in the fields of education, public utilities, industry, government and private practice?
- How much, percentagewise, have engineer earnings increased throughout the country during the period 1952-56?

This latest Professional Engineers Income and Salary Survey is a publication that belongs in every engineering library. It will answer the questions above, along with many others regarding engineer earnings. Use the order blank below to order your copy now.

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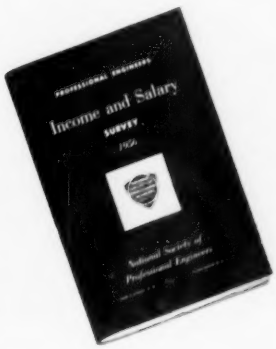

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The Engineer and His Profession—Then and Now

By

THEODORE J. KAUFFELD, P. E.,

Consulting Engineer, New York, N. Y., and Member, NSPE

In their book entitled *The Engineering Profession*, T. J. Hoover and J. C. L. Fish provide an interesting appendix listing many varied definitions of engineering. Commenting on one definition, the authors say: "It lacks something. It does not cover the whole field. Most of the others cover too much: their boundaries take in most of modern civilization."

But two English engineers, A. P. M. Fleming and H. J. Brocklehurst in their book entitled *A History of Engineering* make the unqualified statement that "the history of engineering can be regarded as coincident with the history of civilization." I can see where they got it. Nearly all English writers on engineering at some point lean on what Thomas Carlyle said in *Sartor Resartus:* "Man is a tool-using animal. Nowhere do you find him without tools. Without tools he is nothing; with tools he is all."

By relating engineering to the use of tools, we go back to primitive eras variously known as the Stone, Bronze, Iron ages.

In 1891, an article by J. E. Watkins, entiled "Beginnings of Engineering," and printed in the *Transactions of the American Society of Civil Engineers*, told how in Babylon, Egypt, Palestine, Persia, India, China, and other lands where civilization had an earlier development than in our western world, people built canals for transport and irrigation, reservoirs, and aqueducts, docks, harbors, lighthouses. They built bridges of wood and stone, laid out roads, cut tunnels, constructed viaducts, tested strength and found weaknesses in building materials, had drainage systems, planned fortifications, designed engines of attack and floating bridges, devised methods to transport heavy objects. That writer of sixty-five years ago said these ancients covered to a greater or less degree all departments of hydraulic, bridge and road, sanitary, military and mechanical engineering.

Clearly, the engineer has been around a long time.

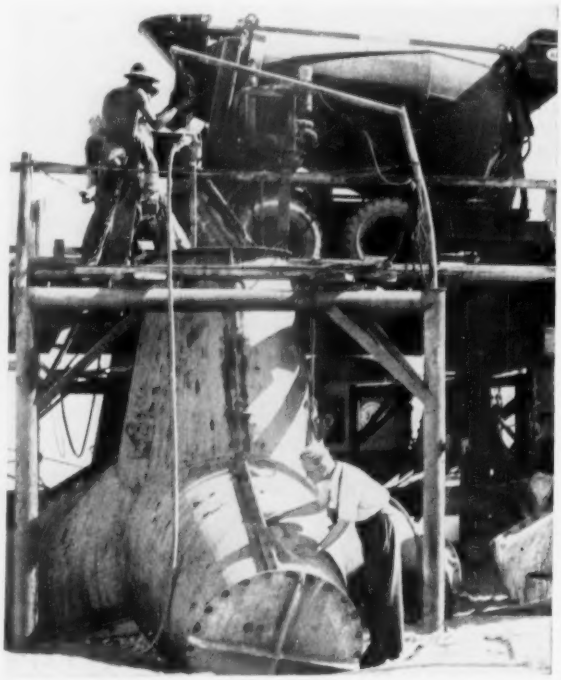
The editors of a book on vocational guidance, published in 1933, said that engineering commenced with man's first efforts to secure and prepare materials, use tools, and direct natural forces for construction. They made a significant point about engineering in ancient days: that there was no transmission of knowledge; each generation began and ended where its predecessor did.

We often are reminded of engineering feats of long ago. Almost invariably the Pyramids of Egypt are cited. The archeological explanation usually reminds us that time was of little consideration, and labor costs hardly mattered. More than 100,000 men worked for twenty years on the Great Pyramid.

Engineering researchers who have dug into the studies of archeologists, bring up data of almost universal engineering interest. Let me give a few examples:

a) The principal tools of the ancients were saws, drills and lathes. The lathe was as familiar a tool in ancient Egypt as it is in a modern workshop.

b) Tunnels were used for the purpose of water supply in the tenth century B. C. The Romans were familiar with the use of high pressure mains. Their com-



This construction engineer's profession dates from the days of the Roman Empire when projects included everything from aqueducts to tunnels.

petence in road building is mentioned in books far beyond the boundaries of engineering.

Just as over-all engineering today is an integration of many fields and subfields, so in ancient days it was practiced in combination with architecture. I really don't know if—with all the great success and honor and the plaudits paid to engineering in the last fifteen years—I really don't know if we are on an eminence to rival the place held by the engineer-architect of very long ago.

In Babelon's *Manual of Oriental Antiquities*, cited in Fleming and Brocklehurst's *History of Engineering*, there appears this statement about the engineer-architect. "He was the adviser of the King, his ministers and his generals, and usually held a sacred office in addition to his secular duties. His burial was solemnized with pomp and display, and statues and other monuments were erected to perpetuate his memory."

COMPARED to such a height, where do *we* stand? It's a question to consider, and a little later on I'm going to consider it. The one thing I ever fear about the engineering profession is that the men in it will become satisfied with themselves. We've had so many compliments in recent years that there's a danger we may begin to believe them; like an actor whose publicity, and the fact that he swallows it whole, makes him almost insufferable.

When I was in high school, I read and remembered the "Essay on Compensation" wherein Emerson talks about the danger of too much praise. He said that if there is a choice between reading an attack on oneself, or a column of newspaper praise, one is better off to read the attack.

Now let me go back for a little while to the earliest known days of engineering. We were enveloped in the world of architecture.

Among the Greeks the word *architecton* was applied to the chief builder, whether he was dealing with edifices, canals, monuments, waterworks, or whatever. Engineering did not establish itself independently from architecture until centuries later.

The word engineer is of Latin derivation, unlike architecture which is of Greek derivation.

In the Roman army, the men who built fortifications, roads, and all such devices to strengthen the military establishment, were called *ingeniarii*. The inventor who devised something new or extremely useful for military use, was called an *ingeniator*. Thus we see the early association of engineering with ingenuity.

In early England, the word *engine* was used as a verb in the sense of contrive, or plan. In literature of 500 years ago there appears this phrase: "They have engined together." And a little later: "The most horrible design that was ever engined." The meaning then, was that to engine something meant to plan it well, or ingeniously. And the one who did the planning was an engineer. There was no thought then of using the word engineer to mean the operator of a device. On the contrary, he designed the device.

Dr. Clement C. Williams has suggested that only in the United States is the word engineer used to identify an operator. Dr. Williams gives a good down-to-earth explanation of what engineering is: A profession involving the characteristics of a science, an art, and a business.

He spells it out. I want here and now to summarize what he says.

a) As a science, engineering requires a knowledge of the physical laws of nature and an acquaintance with the mechanical properties of the materials the engineer uses.

b) As an art, engineering is based on the accumulated experience of the past masters.

The author points out that with so much success behind him, the engineer may become too satisfied. The photo above shows an "old fashioned" method of setting a church steeple; now it's being done by helicopter!

c) As a business, engineering involves the selling of one's professional services advantageously.

THAT is as neat a summing up, as clear and forthright an explanation of what engineering is, as one might want. And one doesn't have to be an engineer to understand it.

Dr. Williams gave that explanation in telescoping the story of engineering's origin in his book entitled *Building an Engineering Career*. Quite likely some of you knew him, because he was variously president, dean, or department head at Lehigh University, University of Iowa, and University of Illinois.

As we all know, military engineering was of primary importance for centuries. Not until the sixteen hundreds did the civil engineer establish status—and late in the century at that. As late as 1650 the man appointed to the office of chief engineer in England was largely concerned with military responsibilities. In fact, when non-governmental, industrial structures were needed, their supervision was in the hands of a millwright, a word hardly ever heard nowadays.

The first record we have of one of us setting himself up and advertising himself as a civil engineer was an Englishman named John Smeaton. That was in 1771, and it may be accepted as the cut-off date differentiating between military and non-military engineering.

Smeaton designed bridges, pumps, drainage works, steam engines, and other machines. He was sitting in the middle of the new industrial age. In a report he made on a lighthouse, he used the phrase "my profession of a civil engineer."

John Smeaton was not the only one in the practice of civil engineering. A generation after he advertised himself as a civil engineer, there occurred the first meeting of the Society of Civil Engineers in London. That was in

1793. Engineering as a profession was on its way. It was meeting some of the essential requirements.

So we are only a little more than 150 years away from the first known society of professional engineers. How much or how little has been accomplished is ever in the realm of opinion. Almost twenty years ago Dr. Dugald C. Jackson in one of a series of lectures reprinted under the auspices of ASME, said: "We apparently must admit the inherited stupidity of human beings. That stupidity is evidenced by the creeping slowness with which prehistoric men improved their means of livelihood when opportunities for improvement lay all around them awaiting to be observed."

Dr. Jackson doubtless read Ralph Waldo Emerson. Not how good we did, but how much better we might have done! Least of all professional men, can the engineer afford to brag. We sometimes deal with imponderables, but assuredly we do not deal with intangibles. A surgeon can address his society meeting and say that it was a beautiful operation, though unfortunately the patient died. A lawyer can lecture at a meeting of the bar association and give praise for the masterly presentation made by a fellow attorney, though unfortunately he lost the case.

But when an engineer has a failure, he cannot find an excuse. There is no excuse. He's in the same boat as the ship captain who is not permitted an alibi. If something has gone wrong, it's his fault. And not to be praised!

This is a factor, perhaps a psychological factor if such stress is allowable in engineering strain, which is inherent in the engineering profession. We have to be realistic because we deal mostly in realty. Poems have been written about the beauty and majesty and inspiration awakened in a sensitive human by the sight of a bridge in the early dawn or at twilight. But the poet glimpses qualities that derive from the finished product.

All of a sudden, there are not enough of us.

For thousands of years we had no separate identity. In ancient days, when Asia and the Middle East were in the era of their glory, the engineer did not even have a name. Later, in Greek supremacy, our kind was a sort of apprentice to the architect—a name that embraced all kinds of building. For hundreds of years we were like draftees for governmental work—at subsistence remuneration, not different from the slaves who worked from our designs, our kind built the imperishable roads and monuments which apparently are everlasting.

For centuries the preponderance of work of our kind was what today we would call defense work. We worked for the military.

The first use of the name Civil Engineer occurred only 185 years ago. It was more meaningful then than now because the expressed, deliberate, imperative meaning was to differentiate from the customary understanding of engineering as military. John Smeaton, Civil Engineer, was putting across the idea that he was in business to plan projects for non-military use.

Our practice is as old as the other historic professions, but our self-recognition, our status in professional life, our stature in comparison with professions of longer recognition—these invite our examination.

I THINK it is clear that engineering was being practiced in ancient days, days prior even to Hippocrates, the Father of Medicine. The physician antedates the lawyer, in the sense of being organized into a profession. But by any standard, the engineer is a newcomer into the professions, old as we are as practitioners.

All professions learn, sooner or later, that their well-being is closely linked to their self-respect. And, as everyone is taught from the earliest years of understanding, self respect is closely related to moral conduct, ethical practice, decent regard for others.

We professional engineers are licensed and registered, and thereby committed to a certain standard. This, I submit, is the minimum standard. The maximum is up to each of us. But to the degree we do better than we have to, to that degree we will be more useful and more prosperous.

As everyone knows from personal experience there are many kinds of doctors. One is primarily interested in his fee, another in the health of his patient. One spends himself to do his utmost, another spares himself come what may to the patient depending on him. There exists among such varied types only a matter of conscience as far as making a standard prevail.

A lawyer is an officer of the court, and presumably a client may have absolute reliance in every lawyer. But such is not always the case, even when the minimum ethical standard is not contravened.

The cases that reach the policing committees of the medical society and the bar association are usually so flagrant that virtual professional unanimity embraces the judgment that is found.

A comparable situation does not exist in engineering. Like a doctor or a lawyer, a malfeasant engineer earns the opprobrium of his fellows. But it would be hard for him to get away with anything. Any departure from the right course cries out. It does not tend to remain a matter between client and engineer. What's wrong shrieks, like brakes overstrained, or gears wrongly used.

In the sense of service rendered, the engineer goes back as far as history records and archeology have been able to reveal. But in the sense of professional recognition, the engineer is of very recent date.

We have come a far way since we started to organize professionally, but we still have a far way to go.

Remember, it's only 185 years since John Smeaton boldly advertised the fact that he was a professional civil engineer. Only 163 years have passed since the first meeting of the Society of Civil Engineers of London. Hardly more than a century—1852—since the founding of the American Society of Civil Engineers.

Indeed we've come a far way. If we realized our national membership potential, we would outnumber every profession except that of the law. There are approximately 20,000 more registered lawyers than registered engineers in the United States, but that disparity will not continue.

(*Continued on page 33*)

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Theodore J. Kauffeld is president and chairman of the board, Devenco, Inc.; director and chairman of the board, Swingfire, Inc., and director and vice president, The Carborid Company, Inc. He was born November 12, 1902, in New York City. After receiving his M.E. degree from the Stevens Institute of Technology in 1924, Mr. Kauffeld was employed as an engineer with Walter Kidde & Co., Inc., and in the years following has held positions with many firms.

A licensed professional engineer in New York and New Jersey, he served as president of the New York Chapter of the NYSSPE from 1956-57. During 1950, Mr. Kauffeld was a member of the special Mission to Turkey for the International Bank for Reconstruction and Development, Washington, D. C. Active in many organizations, he is also the author of numerous articles published in American and British Engineering publications.

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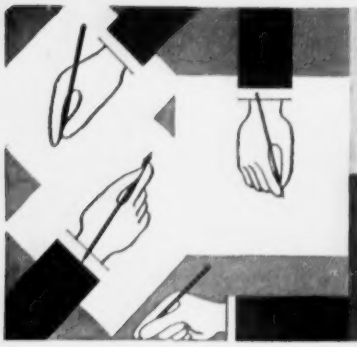

Professional POSTSCRIPTS

Reader E. K. Nicholson of the Pennsylvania SPE has sent along to —PP— an excellent talk on ethics by the Reverend Paul S. Heath of New York. We are pleased to pass along this contribution to our professional engineer readers.

—PP—

Every great expansion of human endeavour and every great creative experience seems to result in codes of conduct to bring order into that endeavour or into the burst of life resulting from the creative experience. The Hebrews when they were delivered from enslavement in Egypt, and having accepted that deliverance as by the hand of God, sought to put into an elaborate code the obedience which this act of deliverance demanded. Much of the result can be seen in the book of Deuteronomy where you will find some very interesting canons on the subject of a man and his work. These still have a very human touch which we often fall short of, as in the command: "When a man hath taken a new wife he shall not go out to war, neither shall he be charged with any business, but he shall be free at home one year, and shall cheer up his wife which he hath taken." Rather nice, that.

The danger with all codes is that the farther they are removed from the initial experience which fathered them, the more unrelated and irrele

Well-known past president of NSPE, Allison C. Neff, has been kind enough to send along an interesting piece dealing with a trip made last spring by him and and wife to Europe. For professional engineers the Neffs' visit to Switzerland is fascinating, indeed, and we are happy to print this portion of the story herewith.

—PP—

In the year 1955-56 when I was president of NSPE, Robert Naef, a consulting engineer of Zurich, Switzerland, was president of the International Federation of Consulting Engineers. This Federation is composed of some 2500 men in private practice in 11 countries of Western Europe.

I knew that our forefathers, who came from Canton Zurich to the United States in 1750, spelled their name Naef; hence we are distantly related, so I exchanged several letters with him.

When I found we were going to Europe this spring I wrote to him again and received a cordial invitation to visit him. When we arrived in Zurich I met this cousin (the families had not met for 207 years!) and he and his wife entertained us royally.

Robert Naef's office is in Zurich but he does consulting civil engineering and power plant work all over Europe and the Middle East. He speaks five languages and can read and write Arabic. In respect to his work in distant countries Robert Naef said that "we should be missionary engineers who are willing to do our work for the welfare of that country with the same zeal as religious missionaries."

Among other interesting things he took us to see the old Naef house at Kappel about 20 miles from Zurich. In 1530 Switzerland was torn by civil war which was a development of the Reformation. Adam Naef, who was the head of the family at that time, distinguished himself in a battle defending Zurich. In recognition of his services the City of Zurich gave him a tract of land and the five story house at Kappel. This award was made in 1550 and the house has been in the family ever since.

It is maintained by the Naef Foundation and is in excellent repair, being used as a museum and library for records of the family.

The enclosed picture of Robert Naef and me was taken on 28 April with the old Naef house as a background. The peculiar looking vine is a pear tree trained "espalier." The timber framing of the structure uses no bolts or spikes. All connections are beautifully mortised. The exposed timbering seen between the stucco panels is protected to some extent by very wide overhanging eaves. The timber is in excellent condition considering it is well over 400 years old.

NSPE Past President Allison C. Neff, left, chats with his Swiss cousin, Robert Naef. See story above.

vant do they become from the contemporary situation. They tend to become hard and formal and traditional rather than inward and compelling and persuasive. Jesus' "Ye tithe mint and anise and cummin but ye leave undone the weightier matters of the law, justice, mercy, and faith," is a case in point.

Our forefathers, by and large, lived by a code of behavior which sprang from an inner compelling conviction. As the code was handed down to the next generation the standard still held some compulsion but the original inner experience which gave rise to the code was lost. The new generation was to some degree held on course by what the sociologists call a psychological gyroscope. Then a following generation quite removed from the original source loses the gyroscope and the standard becomes increasingly meaningless.

This indicates the danger into which codes of behaviour fall. A rather pathetic example of this is seen in the athletes who a year or so ago abandoned the honor system and cribbed in examination. Here was an iron clad code, rigid, demanding, absolute. But it had lost the inner compulsion because it was tradition-directed and had never been woven into the innerlife of the students. So codes which are not given continual interpretation making them immediately relevant to the situation at hand, lose their meaning and their hold. Codes which are the result of tradition or are imposed from without or from the top down, will not stand the test of turbulent or catastrophic experience. Codes or canons have value as they are expressive of an inner conviction which derives from the acceptance of the meaning of life. One of our young ministers in the City working in a difficult slum area, and concerned especially with drug addiction among young people makes the appalling statement that drugs to many of these young people become "the sacrament of the meaninglessness of life." Drug addiction is, as it were, the normal behaviour which follows the acceptance of a hopeless and defeated view of life. Human behaviour originates in the accepted context of life. What is the meaning of my life in my profession? What am I willing to live for? What am I willing to die for?

Well, the ultimate meaning of life lies beyond life. It lies in a man's relation to his Creator. Man is a part of Creation, he is not the Creator. He must find the purpose of his life in the purpose of his Creator for him. Man has been fashioned with all the wonderful powers he has, capable of fathoming the deepest secrets of the universe, with a purpose. A man's life and work must become the expression of this purpose if he is to reach his fullest stature.

I am stressing this because I am certain that our canons of behaviour will have vitality and the capacity to grip and mold our behaviour only as they are contemporaneously expressive of this ultimate purpose in life.

Well, how can we make and keep our canons expressive of the highest professional standards and morally compelling upon our profession in the immediate situation? I think the mutual consideration of daily problems and questions which are troubling us will keep our ethical principles fresh. Then the codes which we formulate would become not so much specific commands or solutions as a construction of the ultimate principles that will provide the tests by which our behaviour shall be judged.

For example, assuming the background of which I have been speaking, a man's relation to his Creator, it follows that the engineering profession has a responsibility to pursue the highest form of creativity. This provides both the fulfillment of one's own God-given creative talents and also one's responsibility to the engineering community of which he is a part. To do excellent work is an essential ethical quality in a creative person.

Again, a basic characteristic of an engineer who is fulfilling his life purpose is integrity. To lead people to false conclusions, to allow pride or ambition or covetousness to compromise the strictest integrity, is betrayal in an engineer. To be known as the strict advocate of truth at any cost—this is the foundation of an engineer's professional life.

Or, take the principle of sacrifice as it applies to an engineer. Fulfilling the purpose of one's professional life requires that one's own well being shall not be the primary concern; but rather one's contribution to society as a whole, in keeping with the ultimate purpose of the Creator. Like the health pioneer who bares his arm to the fever-laden bite of the mosquito, the chemical or civil or electrical engineer is called to act in accordance with claims upon him that go beyond his own advantage or even his personal safety.

The decisions which engineers and physicists have had to make in connection with the expansion of nuclear power are extraordinarily difficult, and do not lend themselves to solution by any simple code of behaviour. Men will differ as to how they should respond to a particular situation. But the world will be farther ahead if men differ out of deep inner conviction, than if they are agreed because some superior power says: "Do this." An ethical canon which provides for vital, living, inner response is better than one that is static and lifeless with no inner persuasion, as those frequently are which are handed down from above or from tradition.

Again, an engineer who is relating his work to an eternal purpose will learn to cultivate attitudes of mutuality, cooperation and professional fellowship. This may not be easy in a profession which frequently encourages a lone wolf type of personality. But we can never be isolated individuals; we belong to a community of people engaged in common pursuits. We need to learn the disciplines as well as the joys of group participation, of sharing with each other our achievements, our problems, our failures. Out of this sharing will develop the climate of professional attitudes.

Enough has been said to make my point that fixed and detailed codes which rapidly become removed from existential experience can become an encumbrance with little effect on current conduct. The air is filled with such codes; election practice codes, fair employment codes, movie producer codes, college football codes, entertainment decency codes and heaven knows what besides. As has been said: "Everyone wants to get into the act," and if they do, the act can get pretty cluttered up. But if our

(Continued on page 49)

Professional Engineers of Colorado—1957 Annual Meeting, September 27, 1957, Columbine Country Club, Denver.

Virginia Society of Professional Engineers—Annual Meeting, October 10-12, 1957, Roanoke Hotel, Roanoke, Virginia.

Washington Society of Professional Engineers—Annual Meeting, October 11-12, 1957, Benjamin Franklin Hotel, Seattle, Washington.

NSPE Fall Meeting—October 17-19, 1957, Grand Pacific Hotel, Bismarck, North Dakota.

North Dakota Society of Professional Engineers—Annual Meeting, October 19, 1957, Grand Pacific Hotel, Bismarck, North Dakota.

West Virginia Society of Professional Engineers—Annual Meeting, October 25-26, 1957, The Frederick Hotel, Huntington, West Virginia.

N.S.P.E. Believes

SALARY SURVEY

BY PAUL H. ROBBINS, P.E.

Executive Director

N.S.P.E.

MEMBERS of NSPE are aware that every two years the Society conducts a survey of the income of its members. The coverage of this survey increases each year thus giving a broad base for the statistical analyses which are possible. As those who will get the complete report will see, the 1956 Income and Salary Survey gives considerable information broken down by types of employment, branch of the profession, year of entry into the profession, regional distribution and grades of employment. In addition, the 1956 Survey makes possible comparisons of increases in engineers' salaries for the last four years.

NSPE believes that the continued periodic surveys of this kind will build up a type of information on which a much better evaluation of both the economic status of the profession and its progress through the years can be judged. Much statistical information on financial remuneration of engineers and scientists is, of course, accumulated by many organizations. It is often times difficult to make comparisons between the various information gathered because in many cases a different type of analysis is desired by those making the survey or a very specific group within the profession are reviewed. NSPE's Survey is believed to have certain advantages which commend it for consideration of those interested in engineering salaries. Among these are that the same segment of the profession is surveyed each time. With only slight variations, the same questionnaire has been used. The questionnaire developed is short and asks a limited number of questions, thus encouraging response.

Because of this consistency, the Survey of 1956 income makes possible rather accurate comparisons of the last four years. Some of the trends about which there has been extensive discussion in the last few years are verified by the NSPE figures; for example, the increase in income of graduates of recent years is higher than is the case for older graduates. The NSPE Salary Survey shows that the increase in salaries for engineers in industry who graduated in 1947 has increased forty-two per cent from 1952 to 1956. Contrasted to this, the salaries of engineers who graduated in 1915 increased in 1956 over 1952 only eleven per cent. Similar figures occur in most other lines of employment. The one exception which might be expected is that salaries for engineers employed in Government have increased approximately the same for all age brackets except for graduates since 1950, whose salaries have increased more in the last four years than have earlier graduates. The percentage increase in the lower decile and quarter of the profession is greater in the upper decile and quarter. Percentage increase for Government engineers has been less than for other types of employment.

It is dangerous, of course, to make broad generalizations from any survey. Careful analyses of the group surveyed and certain built-in conditions which flavor the results must always be noted. This is particularly true of NSPE's Survey for it is a Survey only of registered professional engineers. It is interesting to note that the NSPE Survey shows salaries in almost all ranges and comparisons higher than similar surveys covering nonregistered as well as registered engineers. Undoubtedly it can be argued that registration results in increased income, but it is unfair to say that registration per se results in increased income. It is the fact that the man most interested in his profession, most willing to exert a little extra effort is the man who becomes registered and is increasingly recognized by his employer as worthy of increased income.

In recent weeks there has been a fresh burst of publicity about engineers' salaries and it is interesting to note the extremes of certain spokesmen, as well as the more qualified judgments. On the one hand, a labor leader attributed the present decline of engineering unionization to engineers' favorable economic position. To the contrary, the authors of a new book of the demand and supply of engineering talent contend that engineering salaries have drifted downward in relation to salaries of others.

To analyze and judge statements in this area requires factual background. NSPE believes that the engineering profession has an obligation in all of its relationships to present statements which can be backed by the statistical information or factual information. In order that the public may be adequately able to judge the validity of statements such as the above is one of the basic reasons why NSPE believes its Salary Survey worthwhile.—***End.***

With Our Members . . .

1st NSPE Executive Director

T. K. Legaré Retires As Secretary S. C. State Board of Engineering Examiners

Having attained the maximum retirement age for state employees, T. Keith Legaré retired as secretary of the South Carolina State Board of Engineering Examiners on July 1. He served continuously as secretary and a member of the Board for thirty-five years and missed only one meeting of the Board since it was established in June, 1922. The certificate of every engineer and every land surveyor legally registered or licensed in South Carolina has been issued and signed by him.

At a recent meeting of the Board, Mr. Legaré was elected vice-chairman and retained as a consultant. His term of appointment by the Governor as a member of the Board does not expire until July 1, 1960.

Mr. Legaré will continue as executive secretary of the National Council of State Boards of Engineering Examiners, which office he has held for more than thirty-three years.

The South Carolina Society of Professional Engineers at its annual meeting this year presented Mr. Legaré the first South Carolina "Engineer of the Year" award, and also made him the first life member of the Society. He is a past national director and a life member of the American Society of Civil Engineers; also a life member of the South Carolina Society of Engineers.

The first headquarters office of NSPE was in Columbia, S. C., from September 3, 1934 to April 15, 1935. Mr. Legaré was the first executive secretary and first paid member of the Society. He resigned when the office of the Society was moved to Washington, D. C., as he did not wish to leave Columbia and his other connections.

The following is quoted from a statement by Arthur V. Sheridan, editor, in the first issue of the AMERICAN ENGINEER, January, 1935:

"On December 10th, 1934, the Secretary of State of South Carolina issued to the National Society of Professional Engineers a certificate of incorporation.

"The Society is declared to be 'a body politic and corporate,' having for its purpose 'to advance the standards and standing of the engineering profession in the interests of the public and the profession.' National headquarters are specified as Washington, D. C., with Columbia, South Carolina as a branch office."

Fall Meeting Committee

The Planning Committee for NSPE's fall meeting, Oct. 17-19, in Bismarck, N. D., is shown at a recent get-together. They are, l. to r.: Harlon Erskine; Reuben Reich; A. L. Bavone, NSPE national director; Edward J. Booth, Planning Committee chairman; Joseph Kirby, North Dakota SPE president; Robert W. Carlson, Allan Anderson, and Leslie French. Everett Lobb, not in the photo, is also a Committee member.

Harvey Leaver Elected Topeka Chapter Prexy

Harvey B. Leaver has been elected president of the Topeka Chapter of the Kansas Engineering Society for 1957-58. He is state sales manager for Armco Drainage and Metal Products Company in Missouri and Kansas.

Other officers elected at the recent annual meeting were Harry R. Holzle, vice president; Walter Betterly, secretary; A. J. McCallum, assistant secretary; Louis Unrein, treasurer, and Donald L. Dean, chapter director.

The Topeka Chapter will be host to the annual state 1958 meeting of the Kansas Engineering Society, it has also been announced. It will be the state's fiftieth annual meeting.

By Mrs. Harry G. Kennedy, Chairman of the Ladies Auxiliary Advisory Committee.

THE LADIES AUXILIARIES ADvisory Committee meeting in Dallas, Texas, during the annual meeting of NSPE, was a most interesting one. Mrs. Warner Howe, chairman, presided.

PAPERS WERE PRESENTED ON the following subjects:

"HOW TO MAINTAIN AND INcrease Membership in Auxiliaries"—Mrs. Fred Hendrick; "Projects Recommended for Auxiliaries"—Mrs. Garvin Dyer; "Programs Proven Effective for Auxiliaries" — Mrs. Thomas Conley; "Value of an Auxiliary to the P. E. and His Society"—Mrs. R. K. Rouse, and "Methods for Organizing Auxiliaries"—Mrs. Harry G. Kennedy.

THESE PAPERS COMPILED from information taken from the annual reports of local auxiliaries will be edited in folder form for later distribution. In order to fulfill the many requests for a suggested auxiliary insignia to be used on yearbooks,

(Continued on page 37)

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Restricted to Registered Professional Engineers . . . Directory Continued on Next Page

Auxiliaries

(*Continued from page 35*)

membership cards, etc., the Committee adopted a design submitted by Mrs. R. K. Rouse. Any auxiliary wishing a copy may secure one from the national chairman or from the area chairmen.

COMPLETE MINUTES OF THIS meeting will be mailed to each local president as soon as they can be mimeographed.

THE MEMBERS OF THE National Advisory Commttee for Auxiliaries elected for 1957-58 are:

Chairman—Mrs. Harry G. Kennedy, 1738 London Heights Road, Charleston 4, W. Va.

Area Vice Chairmen—

Northeastern—Mrs. Hugh M. Nelson, 327 Nevada Drive, Erie, Pa.

Southeastern—Mrs. R. King Rouse, 308 E. Faris Road, Greenville, S. C.

Central—Mrs. Ronald Gordon, Box 643, Wilmington, Ohio.

Northcentral—Mrs. Garvin Dyer, 10011 E. 36th Street, Independence, Mo.

Southwestern—Mrs. Cedric Willson, 6705 Mimosa Avenue, Dallas, Tex.

Western—Mrs. Thomas Conley, 710 Peralta Way, Fresno, Calif.

Cutting the anniversary cake of the first auxiliary in South Carolina are, l. to r.: Thomas P. Grimball, Jr., past president of the Piedmont Chapter, S. C. SPE; Mrs. Holmes Frederick, president of the Auxiliary, Piedmont Chapter, and Mrs. E. W. Bryan, organizational chairman.

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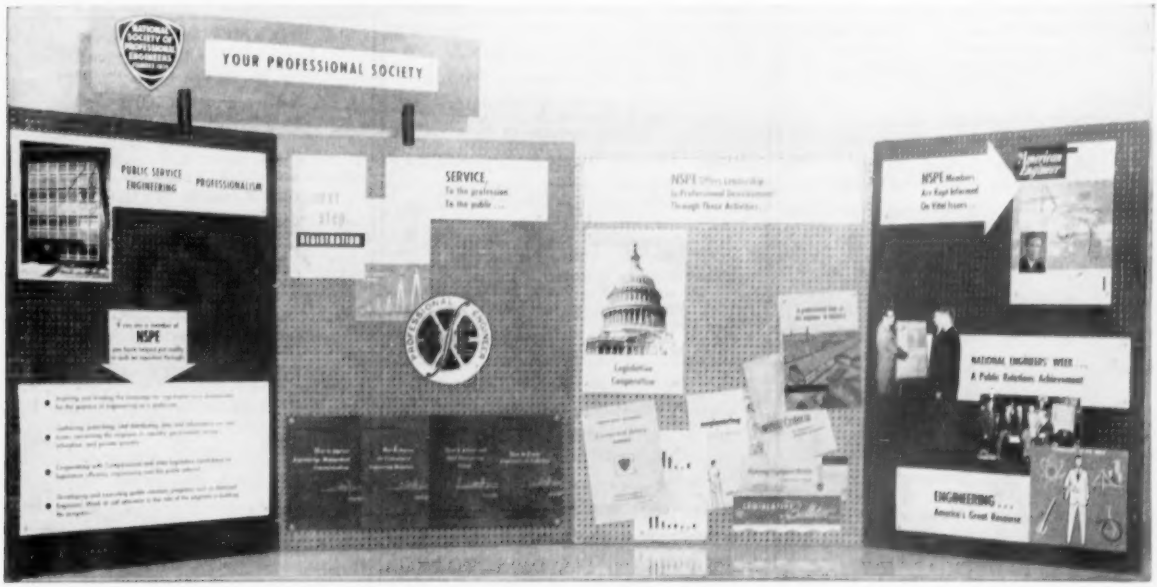

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Freund

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courses, or by means of religious student activities? How can the principle of free inquiry and academic independence be adjusted to the principle of authority which is inherent in all religions?

There are college faculties which have faced up to these questions and have answered them. There are successful programs in religion in a number of American colleges and universities. Courses in religion are offered at Yale. The project for religious instruction at the State University of Iowa has attracted much favorable attention. The Harvard Student Council has recently submitted a report in which they propose to the university authorities "that religion be treated systematically in courses and that it be possible to concentrate in the field."[6] And, of course, religion has long been taught in a great number of colleges and universities which are operated under sectarian auspices. It must not be forgotten that the oldest colleges and universities in the United States originally included religion in the curricula. More significantly, the colonists established these colleges and universities primarily for the education and training of clergymen.

It would take a book to contain answers to all questions which arise the moment you begin thinking about teaching religion in a college of engineering. But one of these questions seems to come up more frequently than all the others. This question is: How can you reconcile the authority implied in religion with the freedom of inquiry and teaching which is a key policy in American colleges and universities?

The typical university teacher declares:

> I seek for truth and knowledge and shall go wherever my search leads me. I shall teach only what my researchers discover. No body is qualified to tell me what I shall teach or not teach: I determine those myself. Nobody can interfere with my subject matter. I recognize no authority except my own scholarship.

On the other hand, religion without authority is a contradiction in terms. God is the Supreme Master of the world, and obviously has authority over all men. Further, clergymen and religious teachers invariably claim to speak from and with authority. Their authority derives from the Creator or from their religious superiors. The very concept of ordination means that authority has been conferred upon the clergyman.

How can the teacher of religion speak from authority without violating academic freedom?

Possibly I do not completely understand the difficulty. But I think there is no actual conflict, or that there need be none. After all, free inquiry is not the only source of knowledge and truth. Select any university man you know who is an ardent champion of the experimental or inductive method. Ask him, "how much of what you actually *know* about everything that concerns you, have you learned from experiment and scientific observation?" If you follow up your point you will embarrass him. Thomas Pollock contends that:

> Another invalid hidden premise is that the experimental approach to knowledge of quantitative science is the only valid method of apprehending truth. This also, of course, is nonsense. The quantitative experimental approach is of great value; most men and most institutions should use it more frequently than they do. But there are many other roads to understanding and truth, which may be summed up as direct experience, intuition and insight. And when we have to decide most of the practical questions of life—whom we will marry, what profession we will choose, what decision we will make day by day; what basic values we will live by; what gods we will worship or refuse to worship—we must put primary reliance on them.[7]

Edmund Sinott agrees with him:

> To many it (application of science) seems the only road which it is safe to follow. But there is a wide terrain into which this newest highway of the mind can never penetrate, a country where are found the rich facts of experience—subjective, primary, immediate; our emotions, desires, purposes, values, feelings of beauty and ugliness, of right and wrong, of love and hate.[8]

The colleges and universities should admit the teacher of religion. His teaching need not conflict with free inquiry. He simply declares that his subject matter derives from sources other than quantitative, scientific experiment.

There is another and even more compelling reason why the authority of religion is not out of place in the university. The teacher of engineering, of any profession, constantly falls back upon authority. The authority of the veteran leaders and thinkers is basic in the professions.

CONSIDER a professor of mechanical engineering who requires his students to design a joint for a high pressure steam generator. One of the boys comes in with a sketch and calculations. They arouse the professor's suspicions. Without looking closely into the student's work he asks him, "Did you check all this against the American Society of Mechanical Engineers' Boiler and Pressure Vessel Code?"

"No, I didn't."

"You didn't. And why not?"

"I thought I ought to use my own ideas."

The professor's reaction is instantaneous and it is sharp:

"Look here, young man, we want you to be original

(*Continued on page 15*)

[6] *Religion at Harvard*. Cambridge: The Cambridge Press, Incorporated, 1956. P. 36.

[7] "Our Heritage of Religious Values." *Religious Education*. I (September-October, 1955). P. 300.

[8] "Science and the Whole Man." *Mechanical Engineering*. LXX (February, 1948). P. 115.

About the Author . . .

Dean Freund

Clement J. Freund, dean of the College of Engineering at the University of Detroit, was born in Appleton, Wisconsin, August 7, 1895. Dean Freund received his A.B. degree from Campion College in 1916 and his M.E. degree from Marquette University in 1922. He joined the Falk Corporation in 1922 as educational director and at that time was also instructor of evening technical courses at the Milwaukee Vocational School until 1932 when he assumed his present position. Dean Freund served as a first lieutenant in the first World War.

In 1953, he was cited by the Common Council, City of Detroit, for twenty years' service and for his contribution to the industrial growth and progress of the community. He is a Fellow of ASME; honorary member of the American Foundrymen's Society; past president of the ASEE; past president of the Michigan Engineering Society, and a member of Tau Beta Pi and Alpha Sigma Nu.

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Nat. Dir., A. L. Bavone, 808—8th St. N.W., Minot, N. D.

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Exec.-Sec., Lloyd E. Chacey, 5 East Long St., Columbus, Ohio.
Nat. Dirs., Ronald A. Gordon, Clinton Asphalt Paving Co., Wilmington, Ohio; Alfred H. Samborn, 352 Boston Place, Toledo 10, Ohio; C. R. Hanes, 581 E. Dominion Blvd., Columbus 14, Ohio; Paul A. Hartamert, 1530 Guild Hall Bldg., Cleveland, Ohio.

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Exec.-Sec., John T. West, Jr., 2121 N. 2nd St., Harrisburg, Pa.
Nat. Dirs., C. L. Kreidler, Lehigh Struct. Steel Co., Allentown, Pa.; Robert F. Miller, 405 N. Lehigh St., Tamaqua, Pa.; J. T. West, Jr., 2121 N. Second St., Harrisburg, Pa.; L. Foster Tierney, 909 Penn St., Hollidaysburg, Pa.; H. M. Nelson, 327 Nevada Dr., Erie, Pa.

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Nat. Dir., Wm. F. Moehlman, 923 Cooper St., Knoxville, Tenn.

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Pres., Gibbs A. Dyer, 819 Telephone Bldg., Dallas 2, Tex.
Exec.-Dir., Gus F. White, 403 Nash Bldg., Austin 1, Tex.
Nat. Dirs., Noah E. Hull, P. O. Box 2539, Houston, Tex.; John L. Pratt, 1330 Mercantile Sec. Bldg., Dallas, Tex.; J. N. Thompson, Univ. of Texas, 173 Engr. Bldg., Austin, Tex.

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Sec.-Treas., William H. Harrison, 313 S. Kimball, Casper, Wyo.
Nat. Dir., A. J. McGaw, University of Wyoming, Laramie, Wyo.

Kauffeld

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There is a big difference, however, between potential and accomplishment. Harold Funk, executive secretary of the NYSSPE, has given me the figures on membership in professional organizations. There is no pride to be had from them, but a very great challenge. We are next to the top in professional numbers, and at the bottom in professional membership.

Dentists have 86 per cent enrolled in their American Dental Association. Physicians have 83 per cent enrolled in their A.M.A. Then the ratio is in a decreasing order: Osteopaths, 72 per cent; Architects, 70 per cent; Accountants, 50 per cent; American Bar Association, 24 per cent; NSPE, 18 per cent.

I don't believe any of us belonging to NSPE will be satisfied to let the comparative membership figures remain static. But our eighteen per cent is not as bad as it first seems. The majority, perhaps the preponderance, perhaps even all members of the NSPE hold membership in one of the Founder Societies. If a member of such a Society became automatically a member or associate member of NSPE, there would be a different percentage story to tell.

A physician belonging to his county medical society becomes automatically a member of the A.M.A. A dentist belonging to his district dental society is *ipso facto* a member of the A.D.A. And so with the osteopaths, architects, accountants, lawyers. A registered professional engineer belonging to a county chapter automatically becomes a member of the state and National Society of Professional Engineers. But members and associate members of the Founder Societies do not necessarily have to be *registered* engineers.

If we took into consideration the membership of the American Societies of Civil Engineers, Mechanical Engineers, Electrical Engineers, Chemical Engineers, and the Mining and Metallurgical Engineers, the total would be close to 100,000. That's not bad. It isn't as good as our professional interests merit, but it is not bad. At the least, it would bring us alongside the accountants, and better by twice the membership ratio of lawyers in the American Bar Association.

HOWEVER, there is neither profit nor satisfaction from a less than good job just because it's better than another profession's performance. We can only win what we deserve through our own merit and effort. But we have to be clear about our situation.

The engineers comprise the only large, important profession where most of its members are not in business for themselves. Approximately eighty-five per cent of our members and members of the Founder Societies are not self-employed.

You have seen what the A.M.A. has done on the question of socialized medicine. I bring it up, because it is immensely interesting from every professional aspect. Ordinarily I would say that invariably, a good professional program is one tied unmistakably to good ethical practice. But many persons, including many physicians in good membership standing with A.M.A., saw no ethical principle involved. They deemed A.M.A. opposition to socialized medicine to be wholly a program of economic preferment to the physician.

The merits of the argument are not interesting to us, but the success with which professional organization can win its way, is highly interesting.

I think much of the success the A.M.A. had in its fight against socialized medicine, derived from the fact that nearly all physicians are self-employed. But not all of it. The success was also considerably due to the fact that the profession went to bat. The necessary money was raised directly from dues paying members of the national *professional* organization.

I stress the fact of the *professional* organization. Doctors, just like ourselves, have societies of specialists. The surgeons, pediatricians, internists, the eye, ear and bone doctors, they have their separate scientific organizations; twenty-seven different kinds.

But unlike the engineer, who has the tendency to put his scientific society first and his professional society second, the physician does it the other way round. First his professional society, to which nearly all belong; the rock, the defender of professional honor, interest, and well-being. When the fundamental has been assured, then on a high scientific plane comes the scientific society, to belong to which is like an accolade, a distinction, a recognition of specialty or superiority.

It seems to me that the engineer reversed this procedure because, unlike the doctor, he was preponderantly not self-employed. At today's state of development, I would see no point in advocating a change. In the future —who can tell what may happen?

The Founder Societies have a wonderful record and therefore superb reputations. They will always be an integral and consequential force in organized professional engineering. They have been, are today, and unquestionably always will be responsible for a high standard of engineering education, engineering competence, and engineering responsibility.

What is missing in this summing up? I can answer my own question quite simply: Missing is the professional integrant, the quality to bring a wholeness to separate bodies; to do, in short, what the A.M.A. does for almost 200,000 physicians.

This was realized some twenty odd years ago when the National Society of Professional Engineers was founded. Indeed, it was felt earlier, when state societies began springing up. But you have to have a national society to accord a true professional status. That's what the organizers were reaching for when they brought NSPE into being in 1934.

The time was ripe for it. A man who is not an engineer in the sense we use the word, but who surely has the reputation of being a very great social engineer, had publicly noted that what engineering needed was a philosophy; or at least, philosophers were desired among engineers. That man was Stuart Chase, the economist. He had had his say in 1931 in a book he called *The Nemesis of American Business*.

Mr. Chase spoke of two kinds of engineers. I offer his idea of each, though one is not flattering to us.

a) The unflattering portrait painted the word picture of an engineer and now I quote, "at the beck and call of the business man, . . . narrow, nearsighted, overspecialized—even as is his master . . . But before he was yoked to the treadmill, there were moments when he glimpsed the dignity, the responsibility, the supreme challenge of his profession; when for a lucid interval he realized that he belonged to the most important profession in the modern world; that indeed he had the world in his keeping."

b) Then Mr. Chase gave his picture of the other kind, one as he said, "having an engineering mind." Here is how he described the engineering mind. "A mind that is professional, not commercial; dedicated to building . . . that is done with false modesty and

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STRICTLY BUSINESS

Personalities . . . **Robert G. Schmidt**, a chemical engineer, has been named project manager for the new $4 million plant of **Callery Chemical Company** at Lawrence, Kan., according to **E. G. Sanner**, president. . . . Promotion of **A. L. Dassler** from assistant chief engineer to chief engineer of **Koehring Div.**, Milwaukee, Wis., has been announced. . . . **Ralph V. Little, Jr.**, has been named manager of the Product Engineering Department of **Brush Electronics Company**, Cleveland, Ohio, a division of **Clevite Corporation**. . . . **George P. Diffenderfer** has been appointed engineering planner in the Engineering Department of **Burgess-Manning Company, Penn Instruments Division**, Philadelphia, Pa. . . . **Lebanon Steel Foundry**, Lebanon, Pa., has named **J. Keith Louden** as vice president, director, and chief executive officer. . . . **Charles S. Bergman** has joined the consulting engineering firm of **Morton S. Fine**, Hartford, Conn. . . . . The **Tobe Deutschmann Corporation** has announced the appointment of **Jerry G. Eicher** as a project engineer at the company's engineering laboratories in Venice, Calif. . . . **Max Moore** has been appointed chief engineer for the Precision Potentiometer Division of **General Controls Co.**, Glendale, Calif.

Robert G. Schmidt

R. L. Beyerstedt, executive vice president-engineering of **The Frank G. Hough Co.**, Libertyville, Ill., has announced the appointment of **Jules C. Laegeler** as chief engineer. . . . **Donald M. McDowell** has been named manager of engineering for the **Le Roi Division, Westinghouse Air Brake Company**, Milwaukee, Wis. . . . **Russell T. Branch**, chairman of the board of **Stone & Webster Engineering Corporation**, has retired after forty-five years of service with the New York and Boston firm. . . . Reorganization of the **American Photocopy Equipment Company's** sales structure has been completed with the creation of a western sales division and the appointment of four regional sales managers. **Arnold B. Perry** was named western sales manager. The four new regional managers appointed were: **Jean H. Rockwell, Roger Rush, Robert McNaughton,** and **George Cibula**. . . . **Intrusion-Prepakt, Inc.**, has announced the appointment of **C. H. Ferguson** as manager of their San Francisco regional office. . . . **Kenneth W. Finch** has assumed the duties of chief engineer of **The Weatherhead Company's Fort Wayne Division**, Fort Wayne, Ind., according to an announcement by **James M. Baker**, vice president and general manager.

Russell T. Branch

Lockwood, Andrews & Newnam, Consulting Engineers, announce the addition to their staff of **Constant Robert Marks III**. . . . **James R. Jaquet** has joined the engineering staff of **G-L Electronics**, Camden, N. J. . . . The board of directors of **Aberthaw Construction Company**, Boston, Mass., has announced the election of **David O. McKinley** as vice president of the firm. . . . **Thomas J. Johnson** has joined **Seiberling Rubber Company**, Akron, Ohio, as a staff engineer. . . . Appointment of **E. J. Schon** to chief planning engineer at the **Lockheed Aircraft Corporation's Georgia Division** has been announced. . . . A number of promotions designed to meet expanding functions of the **Chemstrand Corporation's** Engineering Division have been announced by **C. O. Hoyer, Chemstrand** vice president and director of engineering. **R. E. Wright** has been named manager of the Major Projects Department of the Engineering Division at both Decatur, Ala., and Pensacola, Fla. **Eugene Negro** has become manager of the Process and Planning Department with offices in Pensacola and, in the same department, **A. T. Bogen** has been made superintendent of the planning section and **George Malinoff** has been named superintendent of the process section. At Decatur, **A. B. Terry** has been appointed senior supervising engineer. **W. H. Washington** also has been named a senior supervising engineer to head the Engineering Development Department. . . . Appointment of **Lowell H. Good** to the newly-created post of director, Engineering Utilization, **Radio Corporation of America**, has been announced. . . . **Cornell-Dubilier**, South Plainfield, N. J., has announced the appointment of **L. S. Billman** as chief engineer of its Power Factor Capacitor Division.

Thomas J. Johnson

New Firms—Lab. . . A new standards laboratory for testing and certifying master mechanical and electrical devices has been opened in Clifton, N. J., by **International Telephone and Telegraph Corporation**. It will be known as the **IT&T Standards Laboratory**. . . . **Gershon Meckler** announces the formation of a consulting firm to be known as **Meckler Engineering Company** with offices in Toledo, Ohio. . . . **George E. Miller & Associates** is the name of a firm recently opened in York, Pa., specializing in the practice of civil and sanitary engineering.

Conference . . . **K. S. Bawa**, soils engineer with **Gannett Fleming Corddry and Carpenter, Inc.**, Harrisburg, Pa., will represent that firm at the fourth conference of the International Conference on Soil Mechanics and Foundation Engineering in London, England, August 12-24.

Anderson

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we shall be considering in the near future. I hope that it will inspire some of our engineers to lend part of their years to the people of this country, and to run for public office. Moveover, because the effects of the scientific age are felt by all communities, agricultural or industrial, the engineer is needed in the state and local organizations. I hope he will also bend some effort in their direction.

We should feel thankful that in the early days of our country, some scientists and engineers did not feel their duty ended when they left their laboratory. Such men as Jefferson and Franklin rose to the heights of their great potentialities by devoting their time to public life. Without their wisdom and foresight, Americans might not be enjoying this form of government, which has created the atmosphere for development of all kinds, especially engineering. The engineers of today, to repay the engineers of the past and to help pave the way for the engineers of the future, must assume their responsibilities to the public, as well as to their profession.—***End.***

Freund

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> and all that, but you can't design things which are going to blow up and kill people. If you want credit in this course you had better check your work against the authorities."

The other professions, I think, are no different from engineering. If my appendix has to come out, I want it taken out by a surgeon who has learned his art by sitting at the feet of master surgeons—the authorities.

Why should we be so squeamish about the teaching of religion from authority when engineering, surgery, and doubtless law, architecture and other disciplines are taught from authority, at least in part?

WE Americans are strong for coordination and cooperation, for societies, associations and "movements." We contend, and we think we can prove, that two people or organizations can achieve much more if they work together than the two can accomplish independently. Why should there not be an alliance of religion and engineering?

I have indicated that religious interest, and even fervor, are growing rapidly in the United States. This is good for the American people. I have likewise indicated that engineering science and technology have progressed remarkably in the past half century, and that this progress will probably accelerate in the future. This, too, is good for the American people.

Why should not the two be combined into a single, powerful, abundantly beneficial undertaking?

A new type of engineer is coming to the fore. He is highly intelligent, resourceful, aggressive. He thinks mathematics, physics and chemistry. Startling machines and structures are the products of his thinking. He contrasts with the engineer who thinks machines and structures, and calls upon mathematics and science only when he gets into trouble.

These new engineers are a power in the community. Nobody has yet appraised their contribution, or more importantly, what they promise for us. Why should not these brilliant engineers and thoughtful, dynamic religious leaders get together and pull together? If they do, the American people may shortly measure up to the world leadership which has been thrust upon them.—***End.***

Podnos

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phase has gone very far. The prime objective of the research and development program is to achieve a highly effective research and development output within the limits of available resources including funds and qualified manpower. In view of the ever-growing complexity and cost of new weapons and equipments, the temptation to carry numerous weapon systems or components thereof through the entire development cycle must be avoided to accomplish this prime objective. Attainment of this prime objective requires a high degree of management effectiveness in applying restraint and selectivity.

Let us go back to the two horns of the development animal. When the two horns are not properly identified and clearly separated, we often neglect the management phase in between. This results in a strong tendency for the multiple approaches of applied research to carry on as multiple projects in engineering development and then as multiple items in production for inventory and use. This tendency must be curbed.

You have noted that research and development covers the same territory as research and engineering, and that development is both a research activity and an engineering activity. With respect to the two former Defense offices—Research and Development, and Engineering—the organization prior to 1953 gave to the Research and Development office responsibilities for basic research, exploratory development (or applied research), and engineering development. What is more, the larger part of its effort was devoted to engineering development. If after 1953 the Research and Development office had concentrated its effort upon basic research and exploratory development both of which constitute the research area, there would have been no conflict. As a result of the situation after 1953 both offices were concentrating upon engineering, and the research area was given less attention than its importance warranted. Further, due to the duplication of activity of both offices, the selectivity which was to be accomplished after research, was accomplished with difficulty if at all.

The position of research in this situation was that of the young aspirant for congressional office, campaigning for nomination against the incumbent. His campaign was going poorly, and he was puzzled. Accordingly, he proceeded to question a politically-wise friend of his, as to what was wrong. His friend replied: "Young man, the answer is simple. You are talking about your opponent. He is talking about himself. Nobody is talking about you."

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About the Author . . .

Mr. Podnos

S. S. Podnos is a special assistant to the Deputy Assistant Secretary of Defense for Research and Engineering in Washington, D. C. Born in Lynn, Mass., on April 2, 1915, he received his B.S. degree from George Washington University in 1937. Before assuming his present position at the Pentagon, Mr. Podnos held various other positions with the Government. He has also served on several Government committees.

Active in the District of Columbia SPE, he was chairman of their Public Relations Committee from 1954-54, secretary of the Society from 1954-55, and is currently serving a two-year term as a member of the board of directors. He was on NSPE's National Defense Committee from 1955-56. He holds several patents as well as being the author of a number of articles.

...NEW LITERATURE...

To help the offering firms determine which literature you require, when requesting an item, be sure to list all specifications shown . . . and say you saw it in the AMERICAN ENGINEER.

CLAY PIPE—"Wedge-Lock Clay Pipe," a new brochure for engineers, architects, builders, contractors, plumbers, and public officials, has been published by the Robinson Clay Product Co., of Akron, Ohio. Completely illustrated, this two-color, four-page, file-size brochure offers complete information on the time-tested qualities of vitrified clay pipe with the revolutionary new factory-made Wedge-Lock plastic joint that snaps together instantly. The brochure also details the mechanics of Wedge-Lock's total-contact joint, illustrates the simple installation procedure, describes clay pipe and fittings available in diameters from 4 to 15 inches, and outlines conditions where Wedge-Lock has solved jointing problems. The brochure is available from the Robinson Clay Product Co., 65 West State St., Akron 9, Ohio, or from any of Robinson Clay's 14 branch offices located in major cities in the United States and Canada.

—AE—

OVENS—Specialized ovens, water baths, and humidity chambers are illustrated and described in a bulletin issued by Soiltest, Inc. These units are designed to be used in the field or laboratory for testing soils, concrete, asphalt and other construction materials in accordance with ASTM and AASHO specifications. Full visibility jar baths and metal water baths for laboratory use are illustrated. Other items include bituminous penetration devices and the standard rotating shelf asphalt oven. A new type hydrometer jar bath, hydrometers and stirrers used in the determination of fine particle sizes in soils by the hydrometer analysis method are described. A new, low cost relative humidity chamber designed for use in making standard cement tests is introduced. Aggregate batch ovens for large scale laboratory drying operations are fully described. The bulletin is available from Soiltest, Inc., 4711 W. North Ave., Chicago 39, Ill.

—AE—

CONSTRUCTION—A Construction Detail Folder containing scale drawings of comfort applications of Styrofoam, a Dow expanded plastic foam insulating material, is now available. The 12 drawings show application of Styrofoam to either a wood or metal window installation, to a masonry wall at the door opening, horizontal or L installation under a concrete slab, vertical installation on a foundation, in a crawl space, on the exterior of a foundation wall, and in connection with either a perimeter heating duct or an electrical outlet. Also included in the file-size folder is a drawing of a push box for application of adhesive to the Styrofoam. Accompanying the drawings is information giving size, properties of the foam and data on either plaster base or perimeter insulation. Plastics Sales Department, The Dow Chemical Company, Midland, Mich.

PIPE COVERING—A complete new size, price and technical data brochure on Styrofoam low temperature pipe covering has been announced by Glo-Brite Products, Inc. of Chicago, Ill. Sizes, prices and a comprehensive guide in ordering are given in this brochure for anti-sweat, light, standard and heavy duty wall thicknesses pipe covering as well as fitting covers and vessel-tank insulation. A special list gives sizes

and prices for Domestic Pipe Size coverings to combat condensation problems on cold water pipes in the home. Write: Glo-Brite Products, Inc., 6415 N. California Ave., Chicago 45, Ill.—Dept. P.C. 3.

—AE—

HIGHWAY BROCHURE—A brochure on aluminum highway and street sign blanks, featuring a complete list of sizes and specifications for standard blanks, has been published by Reynolds Metals Co. Specifications are in accordance with those in the manual on Uniform Traffic Control Devices for Streets and Highways. Attention is also called to the company's engineering services, which offer assistance in any design and production projects involving the application of aluminum to highway market problems. Copies of the brochure can be obtained by letterhead requests to Reynolds Metals Co., 2500 South Third St., Louisville, Ky.

—AE—

WATER HEATING—Heating and plumbing engineers and contractors are offered a handy guide to selection of domestic water heating and piping specialties in a catalog released by General Fittings Company, East Greenwich, R. I. Containing more than one hundred illustrations and diagrams, this 16-page catalog gives detailed information on the company's line of external and internal tankless water heaters, indirect water heaters, mixing valves, water hammer silencers, pipe unions, solder fittings, and other specialties for residential and commercial heating and plumbing systems. Copies can be obtained by writing to the manufacturer for Catalog No. 22.

FLEXIBLE METAL HOSE—A streamlined condensed catalog just received from Universal Metal Hose Co. of Chicago, covers the complete, wide range of flexible metal hose manufactured by this company, with recommended pressures, temperatures and specific used for which each type is suited. It will make an excellent reference book for designers, engineers, maintenance men, and purchasing agents who have occasion to use metal hose for original equipment or replacement. The various types of hose are completely described and illustrated, including the various styles and sized of both the seamless, corrugated type and the interlocked type, with or without packing, as well as the styles or couplings used for each. Copies of this new Universal Catalog No. 1D-100A may be procured by writing Universal Metal Hose Co., 2133 South Kedzie Ave., Chicago 23, Ill.

—AE—

BLUEPRINT FILE—A bulletin has been released on Inter-Master Blueprint Files by Stacor Equipment Company, manufacturers of drafting and filing equipment. Specifically designed to meet General Services Administration specifications, these files have unique advantages and a wide range of use. Government standards among other things demand that all units shall interlock and intermember with their existing units, therefore, the bulletin points out, these Inter-Master files will also interlock and intermember with standard cabinets of other manufacturers now in use throughout industry, federal, state, local and educational institutions. Ideal for both active and inactive filing of blueprints, maps, drawings, artwork, tracings, electrotypes, boards, or swatches, the bulletin illustrates the fine construction features of this Inter-Master series. Precision built of welded heavy gauge steel for lifetime use, drawers roll smoothly on case-hardened ball bearings, cannot be pulled out accidentally. Copies of the bulletin are available from Stacor Equipment Company, 768 East New York Ave., Brooklyn 3, N. Y.

—AE—

ENGINEER GUIDE—Practical advice on the selection of an engineering firm is now available in a newly revised brochure being offered by the Teller Company of Butler, Pa. Developed in the interest of good management practice, the brochure, entitled "A Guide for Selecting an Engineering Firm," answers in detail three basic questions asked by companies having engineering problems: 1) Do we need an engineering firm; 2) Whom should we choose; and 3) What results can we expect? Beginning with the needs for an engineering firm, the Teller booklet offers guide-post to help company officials determine whether to choose a firm that deals in consulting engineering, construction engineering, or design engineering, and points out the specific differentiations of each.

These listing are informational only and are not an endorsement of the products, nor of the manufacturer's claims.

Podnos

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Because of continued albeit unknowledgable agitation, and the fruitless discussion already mentioned, as to what was research and what was development, the Hoover Commission in 1955 recommended that the two offices be consolidated. Secretary Wilson did not accept this apparently simple solution at that time because there was no assurance, under the then existing conditions, that the original goal of adequate attention to both scientific research and engineering would have been realized. Now, however, with more experience in back of us, we have been able to carry out the Hoover Commission recommendations for one consolidated office. With an effectual internal organizational structure and experienced personnel, we now have the basis that should assure the realization of effective attention to basic and applied research as well as to engineering development.

However, we do feel that the current rate of technological advance has brought about an increasing closeness between basis research and engineering application. For this reason research activity and engineering activity should be a correlative endeavor. Engineering people should participate in the latter stages of research to the extent of acquainting themselves with what is coming along. By the same token it is even more important that research people participate in the preliminary stages of engineering for they are the source of knowledge so necessary to application for use.

WHAT I am saying is that the team approach is not only beneficial, but is becoming a necessity. But it is important to define who is the captain of the team. When conducting basic and applied research he should obviously be a research person. When conducting engineering it is reasonable that he should be an engineering person. Engineering here is a type of activity. I have no intent to imply that a graduate engineer is the only type of person who can captain this branch of engineering activity.

It is also of importance that the research person not overindulge in engineering development, for his time is too valuable in research. For of the two, research and engineering, research is more difficult. In research one deals with ideas while in engineering he deals with things. Too many of us tend to regard the process of thought as "non-productive." Unfortunately this association has become so ingrained that too many of our research scientists are doing engineering development. This is human nature. Why do the difficult when you can do something easier? And it is for this reason that when a research scientist is given both an idea and a thing to work upon, he invariably emphasizes the thing and research suffers. This detrimental practice must be stopped so that the scientist can concentrate upon the research that is his true pursuit.

Three of the most spectacular achievements during World War II were in the fields of electronics and nucleonics; radar, the proximity fuze, and the atom bomb. The scientific research for all three were of foreign origin. We in America have not emphasized scientific research, including basic research, as much as we should have. We have been inclined in the past to put our chips on engineering, and in so doing have built an industrial empire without equal. But to keep pace, engineering needs research. We have just about drained the available reservoir of basic scientific knowledge that has not been applied. Scientific research must be increasingly encouraged until our way of life is as dependent upon it as it is upon engineering. We in the Office of the Assistant Secretary of Defense for Research and Engineering are dedicated to the overriding importance of both basic and applied research as a means for maintaining and enhancing our position of technological superiority.

The research area must be emphasized for another reason—to enhance our long range planning. When it is not emphasized, there is a tendency to base long range planning upon current developments. This is erroneous practice, for it results in current planning rather than long range planning. Long range planning must be based upon research to make it effective.

Much criticism has been heard about the type of person thought necessary to head the consolidated Research and Engineering office. Be assured that it is not of importance whether the head be a physicist or an engineer. What is important, is that he should have executive ability, have a good understanding of both research and engineering, be a good administrator, and have vision.

OTHER criticism of this consolidation of offices has cited the "strangulation of the research and development program caused by a constant level budget concept." Here is a case where those that are criticizing are looking at apples and talking about oranges. True, the research and development money appropriation has not fluctuated appreciably. However, whereas the research and development appropriation originally paid for the research and development program, within the last few years there has been an increasing amount of procurement money used for this program. For example, in this fiscal year approximately 5½ billions of dollars is going towards the research and development program. Of this approximately 1½ billions of dollars is research and development money. For the next fiscal year it is estimated that a total of six billions of dollars will go to the research and development program. This amount is more than half of the total monies spent for research and development in this country by both governmental and non-governmental sources. This is a far cry from "strangulation."

It is only within the last year that we have known the total monies going into the research and development program. This determination was made at the request of the engineering office to assure ourselves that sufficient funds were being devoted to the research and development program. And now as a consolidated Research and Engineering office we intend to find out how much of the research and development money appropriation will go to research, to assure ourselves that sufficient funds are being devoted to this area. Current practice is to talk of research and quote research and development data. This practice is misleading.

The unfortunate misunderstanding that has persisted in some scientific circles and in the press is that the overall problem and our internal organizational solution in some way involves a "battle between scientists and engineers," or in clear terminology, between scientific research people and engineering people, and that the organizational change is a victory of some kind by one group over the other. Nothing could be further from the facts. It should be evident from my discussion that the consolidation was made to increase, and not to diminish, emphasis on research. Those people that are serving as the source of criticism—the press says they are many, although I doubt this—let those people stand up and be counted. I say they are not properly informed, and until they are the dissential effects caused by their criticism is a detriment to the job which we are trying to do. Let us cease the

argument and devote our efforts to more constructive tasks.

For scientific research is to engineering what motherhood is to the child. As the mother gives life to the child, so does scientific research give life to engineering. If engineering were to throttle scientific research, it would only serve to throttle itself. There can be no victory, nor exalting, of one over the other. Both are equally necessary. To the question, "Is Engineering Throttling Scientific Research?" the answer must be No.

Our technical capabilities and our accomplishments have increased tremendously in the present generation. Our technological advances are proceeding at an ever-increasing rate over growing horizons. To maintain the national security and to promote the national welfare, scientific research and engineering must walk hand-in-hand into the future. ***End.***

Kauffeld

(*Continued from page 43*)

> has the courage to accept the job of taming the billion wild horses which Watt let loose; that thinks straight and hard; hates waste and confusion, dirt and despair; that never stoops to the shoddy or the adulterated."

The second description gives a pretty good picture of the way we like to regard ourselves. Chase was right. What we need, above all, is a philosophy. As experts in our varied specialties, we know how to apply a theory. The researchers in the laboratories have built the foundation on which engineering has risen to its present eminence. But we have not yet evolved a theory for engineering principle, using that phrase in contradistinction to engineering principles.

The principles, as scientific bases, we have down pat. But a principle, as a philosophical foundation, we have yet to come by.

That's where the NSPE comes in.

We are Johnnies-come-lately in the world of great affairs. As Stuart Chase implied, most of us look to a superior, if not for guidance, then for direction. Anything that endures over the ages sort of gets in the blood. The engineer has been doing his job for thousands of years. For centuries he was like an apprentice to an Asiatic combination architect and builder. Then he was an important complement of the military machine, and under the Greeks and Romans and long after their civilizations had started to wane, he was still a glorified supernumerary working for the military.

Less than 200 years have passed since the engineer set himself up as an independent professional. In that time he has pulled himself up by his bootstraps. Consciously and instinctively, he has reached for professional status. He has continuously seen to the upgrading of engineering education, strengthening the profession's ever higher regard for its own performance. He has buttressed the reliability of the engineer's work by invoking the law's protection for those who use his work. He has agitated for the professional licensing of the practicing engineer in order that every professional engineer's claim to competency is tested by an official examination prior to registration.

There is today in every one of the forty-eight states and also in the territories of the United States a control of engineering practice by law. The profession is not finished in that field of supervision. True, every state and territory exerts such control, but not always in superior degree. The ideal will be reached when every state and territory has on its statute books what we engineers call a Model Law, similar to that existing in the State of New York.

By its innate nature, engineering has grown into Big Business. Big Business is a relative term. Go back before World War I, and except for the Morgans and Rockefellers and a few such concentrations, Big Business represented a relatively small segment of the economy.

The last thirty-five years have brought about an expansion, which few forecasters could have imagined; perhaps none. There are very few persons, in any generation, who can project themselves beyond their experience. As a group, perhaps engineers are unique in the category of those who can. Though they deal in the very essence of reality, they possess the imagination to dream, and that's the quality which paves the road for the forward march of civilization.

Every worker has a useful place, no matter how modest his contribution to society. The man who collects the toll on a bridge is not as important as the man who designed the bridge. But withal he makes a contribution to society. The engineer does not have to pull anybody down in order to build himself up. His professional work is measurable without needing comparison to the work of any other professional field.

We've got every right to be proud of what we do. Our immense contribution to society is self-evident. We are in an exceptional position today to consolidate the gains recently made. The natural way for us to do it is to strengthen our professional authority. This is no time for us to take a back seat. I think of a young fellow who last year was being interviewed by one of the scouts industry sends out to the university campus. The boy was modest, and the interviewer told him, "This is no time to be bashful." We can take that advice to ourselves.

Long ago, I read in one of William Haynes' books the story of Dr. Backeland and Eastman Kodak. He had invented a photographic item, sent it to Rochester for analysis, and now was going to see Mr. Eastman to sell it. Dr. Backeland told himself he'd ask $50,000 and not take a cent less than $25,000. He told it to himself over and over, like a refrain. He thought of it at night, at breakfast, on the ride to the plant, when he entered Mr. Eastman's office. Mr. Eastman led the discussion into many fields. After an hour of talk, Mr. Eastman came to the point. Dr. Backeland braced himself. This would be it. "I'll ask fifty, but won't take a cent less than twenty-five." Mr. Eastman said: "We like it. Would it be agreeable if we offered you a million dollars?"

This is no time to be bashful. It is time for us, for all of us, to mark the solidarity of our group. The engineer makes a supremely important contribution to society. But because, preponderantly, he is not his own boss, he has a tendency to minimize his own importance.

This is no time to be bashful. We are the mainspring in the works that is developing a wondrous civilization. The engineer is in a better position than, perhaps, ever before; and getting better all the time. We will find that his personal progress, his place in appreciation, his pride in work, his *esprit de corps* . . . we will find that his personal place in society will be directly related to the position of his profession.

We are progressing superbly, not only because of an ever increasing use of the engineer, but because of an ever increasing regard for him. And that regard is a corollary of our advancement as a profession. And our advancement professionally is considerably due to our professional society, NSPE.

I say to you, be an active member, get your non-belonging engineering colleagues to join. You will find the NSPE is like the old maxim of the Three Musketeers—one for all and all for one. ***End.***

Early Plans For Engineers' Week, Feb. 16-22, Underway

The 1958 National Engineers' Week will be held during the week of February 16-22, John L. Bahr, chairman for the observance again this year, has announced.

The NSPE sponsored observance is held each year during the week of George Washington's birthday. It features tributes from the President of the United States, the governors of most states, and the mayors of hundreds of cities throughout the country.

In announcing the dates for the 1958 Week, Chairman Bahr urged all NSPE affiliates to appoint Engineers' Week committee chairmen as early as possible. "Past experience has shown that early organization of committees is the foundation for a successful program at the local and state levels in February," Mr. Bahr said.

The Chairman added that "chapters should take particular care to avoid the pitfalls of placing all the burdens of the Week on the shoulders of one or two individuals." Mr. Bahr suggested that local chairmen for the Week should be selected not later than September.

Promotional kits for the 1958 observance will be distributed by the National Society in mid-October. The kits will contain basic promotional material and ideas which can be used to build a working Engineers' Week program.

The National Society will once again offer a selection of promotional aids for the Week, including tape recorded programs for radio, TV films and slides, posters, banners, newspaper feature stories, logotypes of the poster design, and lapel buttons. A booklet on industry participation will be distributed to leading firms.

The theme for the 1958 Week is ENGINEERING BUILDS BROADER HORIZONS. This theme was chosen because during the International Geophysical Year man will extend his horizons further than ever before—even to the placing of a satellite outside of the atmosphere of our planet. Engineering has given us the instruments, the rocket fuels, the electronic devices, and all the other equipment which is being used to gather information during the IGY.

A list of nationally known engineering leaders who will serve as sponsors for the 1958 Week will be published in the September issue of the AMERICAN ENGINEER.

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Mechanical Engineer, registered in Del. and Penna. Twenty-five years of broad experience in supervision, plant engineering, plumbing, heating, ventilation, air conditioning. Fluent in Spanish. Desires position with responsibility. Box 801 AMERICAN ENGINEER.

—PP—

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canons can simply define the basic principles of the acceptance of a meaningful interpretation of life and these be supplemented by on the spot group fellowship discussions of particular situations; this, it seems to me, will produce responsible behaviour that may permeate the entire profession.

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What's New

This column describes new products of general interest to professional engineers. For further information, circle the item number on opposite page and mail to the AMERICAN ENGINEER.

These listings are informational and are not an endorsement of the products, nor of the manufacturer's claims.

AIR COMPRESSOR — Item 30

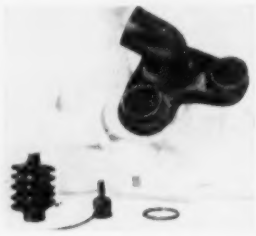
The lightest, shortest-turning 600 cfm rotary air compressor manufactured to date has been announced. It is the first of a new line of rotary air compressors; a portable, two-stage, sliding vane type and rated at a free air capacity of 600 cfm. Dry weight is but 7730 lbs., and it has a turning radius of only 11 ft. 11 in.

TRIGULATOR — Item 31

A new approach to angular calculation has been made with the introduction of the "Trigulator." The scales can be calibrated in any denomination applicable to its intended use. For tool and design work they are calibrated to read to three decimal places linear and one minute of arc angular. It can calculate any trigonometry problem in about one-tenth of the time normally required by mathematical processes. It is claimed to be a great time-saver for engineers.

LOW-COST PROTOTYPES — Item 32

"Prototypes by Kotokast," a new concept in forming rubber and plastic parts and products for experimental engineering purposes at low cost, has been announced. Using either plastics, latex or various synthetic elastomers, "Kotokast" can achieve remarkable economies in development programs and where prototype experimentation is necessary prior to production commitment.



BLUEPRINT PAPER — Item 33

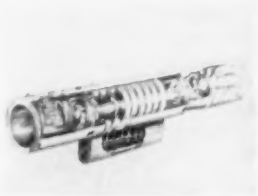
A new blueprint paper—Challenge Blue Ribbon—that combines for the first time high contrast with wide latitude in printing speed has been introduced. It requires no change from standard printing or developing techniques. Representing the first improvement in blueprint paper in many years, it has a lustrous blue color and sharp white lines. Its printing speed latitude, according to lab tests, is 30 to 40 per cent greater than the best papers presently available.

ROTARY AIR DRILL — Item 34

A rotary air drill mounted on a self-propelled air compressor has been developed for use in well drilling, blast hole drilling, seismic and exploratory drilling and for surface operations in underground mining. Known as the Pneumatractor Rotadrill, this compact unit features low original cost, convenient hole-to-hole maneuverability, and economical operation.

DUST COLLECTOR — Item 35

Industry has been offered a new tool for dust collecting chores. It is described as one-tenth to one-twentieth the size of comparable equipment. Called the Joy Microdyne dust collector, the unit is a wet, inertial type. Test figures show that it has an efficiency of 99-plus per cent in collecting dust particles of five microns or greater.

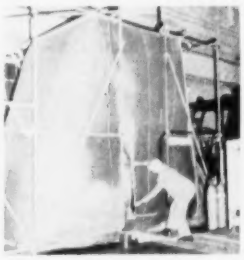


POCKET ORGANIZER — Item 36

A 5-featured saddle leather case that offers unusual utility for the engineer, draftsman, technical students and professional men has been put on the market. Three compartments—to carry 6 inch slide rule and plastic rule, and up to 6 pens and pencils. Spring steel (leather covered) safety clip keeps case from being lost out of pocket. Identification card in patch pocket helps the case (and its contents) find their way back to you in the event that you misplace it. Fits coat, jacket or shirt pocket.

TRANSLUCENT FABRIC — Item 37

A fabric that will keep working areas free of dust and contaminating fumes, allowing the penetration of natural light, has been developed. This tough laminated light weight, acid resistant fabric will allow natural light to flood a working area thus reducing the need for artificial light. It is waterproof, fire resistant, rot and mildew proof.



TAPE TYPEWRITER — Item 38

A major advance in office automation has been achieved with the introduction of an electronic punched tape typewriter. The machine automatically creates and reads a paper tape that activates other equipment and wire communications systems. When used as an ordinary electric typewriter in preparing source documents, it automatically translates everything or selected data the typist writes into a punched tape for subsequent automatic processing. It types at the rate of 120 words a minute.

ALARM SYSTEM — Item 39

Zonalarm, a specially designed fire alarm system to meet the needs of medium and small factories, small businesses and semi-commercial buildings, has been announced. The system is the first low-cost, completely automatic fire warning and locating unit offering many features of more expensive systems, according to company officials.

American Engineer

Readers' Service Department

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AUGUST

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